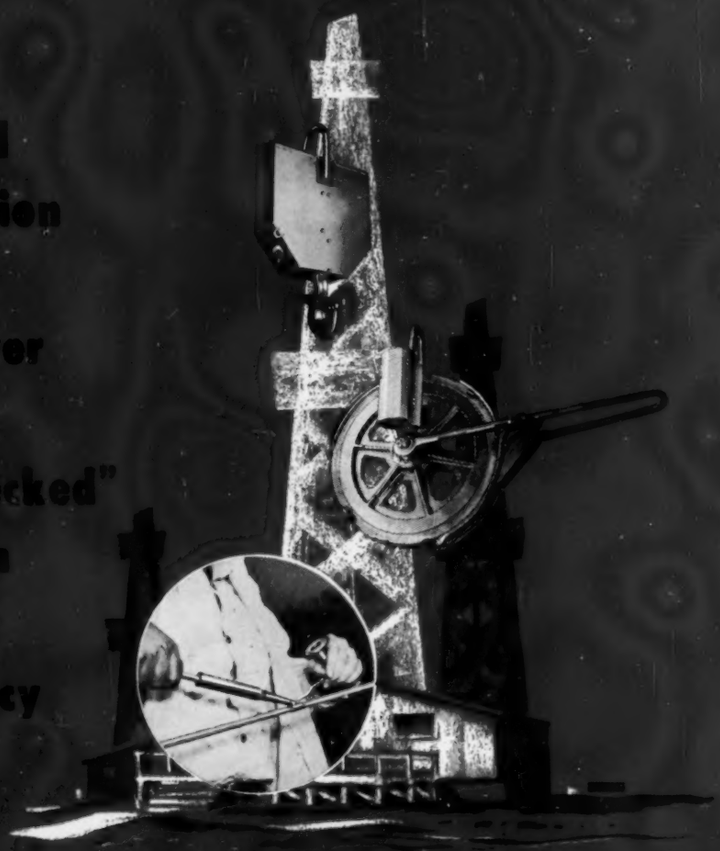
World Petroleum

FEBRUARY 1934

ve dollars per year
ne dollar per copy

it takes real precision instruments to deliver Lane-Wells "triple-checked" depth measurement accuracy



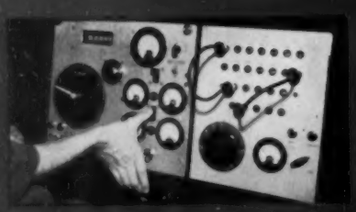
It may be a little difficult to think of cables and sheaves as "precision instruments," but those used in Lane-Wells perforating are just that — for the following reasons:

Every one of Lane-Wells armored **conductor cables** is flagged and individually calibrated. Its variations under load and depth are accurately charted and recorded. Using the stretch figures for the cable which is being used, the perforating operator can really pin-point the position of the gun.

Each **measuring sheave** over which the cable runs has a built-in micrometer adjustment to compensate for even the slightest wear, guaranteeing continuous accuracy of the rim of the sheave.

The **weight indicator** is built around a precision-formed helical spring whose performance characteristics have been accurately determined by repeated tests, and which is sensitive to the slightest variation in load.

Working with precision instruments like these, it's no wonder that Lane-Wells depth measurement accuracy is conceded to be "the standard of the industry"!



Tomorrow's tools - today!

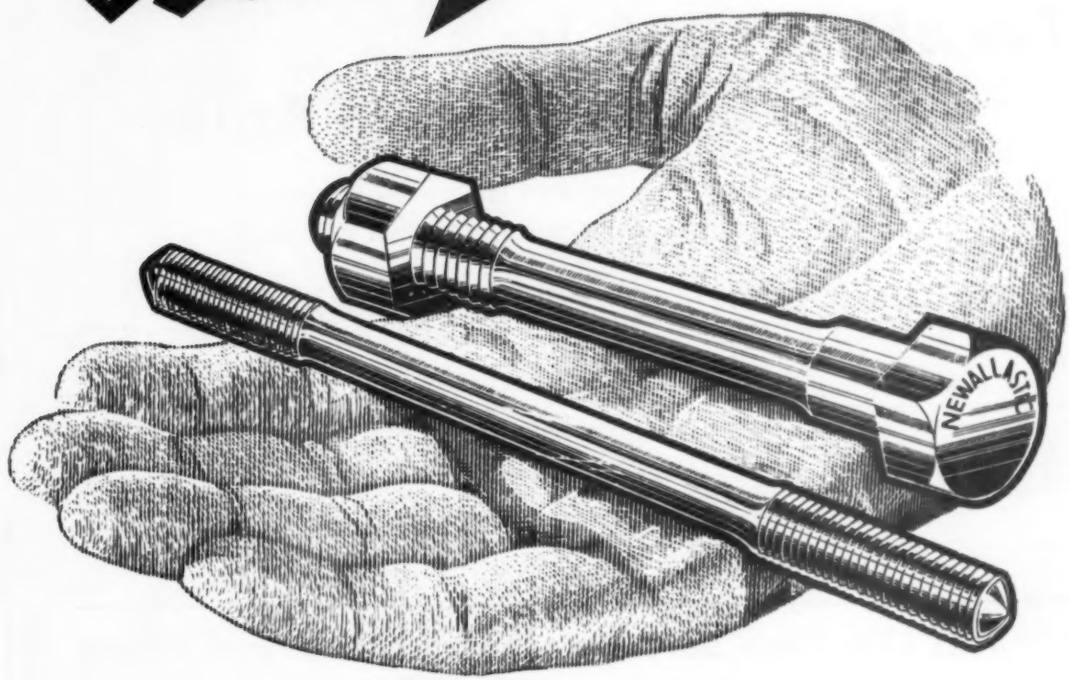
LANE WELLS COMPANY

BETTER PERFORATING

General Offices, Export Office, Plant • 5610 So. Soto St., Los Angeles 58

LOS ANGELES • HOUSTON • OKLAHOMA CITY • LANE-WELLS CANADIAN CO. IN CANADA • PETRO-TECH SERVICE CO. IN VENEZUELA

Unique



"Newallastic" bolts and studs have qualities which are absolutely unique. They have been tested by every known device, and have been proved to be stronger and more resistant to fatigue than bolts or studs made by the usual method.

C. P. Newall & Co., Ltd.

POSSILPARK GLASGOW · N

What's NEW

In Perforating, Logging, and Fishing Tool Services

McCULLOUGH®
NEW SERVICES • NEW TOOLS
NEW WAYS OF DOING THINGS

Latest News About New Tools, Techniques and Services

Two JET CUTTING Tools . . .

That Save You Many Hours of Rig Time

Controlled, Concentrated Jet Power—Harnessed to Cut Casing or Fragmentize Bottom Hole Junk

1. McCULLOUGH JET CASING CUTTER

SLASHES RIG TIME. This jet tool will accomplish a casing cutting job in only a FEW MINUTES compared to the ten hours to several days that would be required for mechanical cutting. No rotary table is needed—round trips with drill pipe or tubing are eliminated.

The McCullough Jet Casing Cutter is lowered, positioned and fired on an electric wire line. When the tool is fired, the casing is severed in a clean, straight line without damage to an outside string. This method is accepted as standard practice by major oil companies. It is an ideal companion tool for the McCullough Magna-Tector—used first to accurately locate the stuck point.

2. McCULLOUGH BOTTOM HOLE JET CUTTER

SIMPLIFIES AND SPEEDS the recovery of fish in the bottom of the well. Large pieces of junk at the bottom of the hole that are too large or too difficult to be easily recovered are instantly broken up into small pieces by the concentrated power of this jet tool.

Articles such as rock bits, slips, reamer bodies, etc., are fragmentized so that they can be easily recovered by usual methods. One shot is usually sufficient for small objects. Larger objects require several shots.

Operators have saved hundreds of hours of rig time and eliminated many a costly fishing job by use of this reliable jet tool.

Jobs Like These Save Operators Rig Time and Money

(Actual jobs taken from McCullough Field Reports)

1. Lower half of a 12¼" hole opener twisted off. The fish was approximately 9" long and 6" wide. After trying other methods of recovery, a 6" McCullough Bottom Hole Jet Cutter was used to fragmentize the fish and the pieces were recovered by a magnetic fishing tool. The operator ran back in with a bit and made hole. Later, when he pulled out, a short sub was accidentally dropped down the hole. Another 6" jet shot was used. The fragments were easily recovered and drilling continued. Several days of lost rig time were saved on this job.

2. A 10¾" McCullough Jet Casing Cutter was used to recover 4000 feet of 10¾", 51 lb., N-80 casing. This job was performed in 5° below zero weather in only three hours—including running the cutter and freeing the pipe.

3. A 3½" O.D. McCullough Bottom Hole Jet Cutter was used to eliminate bottom hole junk at 11,495 feet. Temperature approximately 280° F. Operator had previously spent three unsuccessful days trying to drill by the junk. McCullough accomplished the job in four hours.

4. McCullough Jet Casing Cutter used to recover 13,005 feet of 5" O.D., 18 lb., N-80 casing. Temperature was above 277° F.—pressure 12,700 lbs. Total time on the job, including running a feeler, one jet cutter run and freeing the pipe—five hours.

CALL YOUR McCULLOUGH SERVICE ENGINEER

. . . or write for complete information on these two time saving, economical jet tools.

PERFORATING, RADIATION LOGGING, AND FISHING TOOL SERVICE—ANYWHERE—ANYTIME.

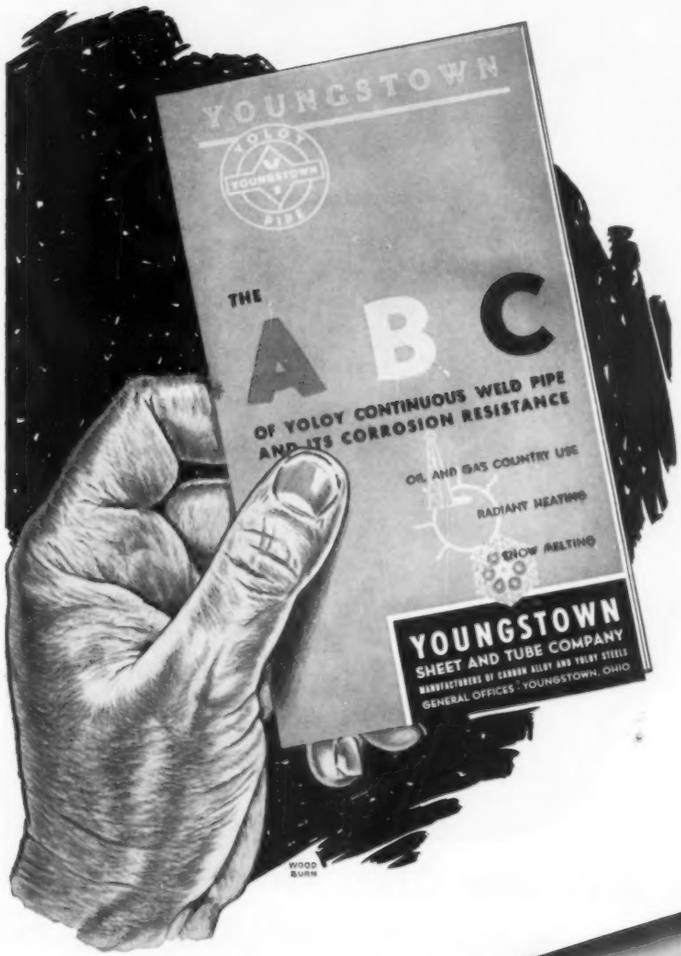
McCULLOUGH TOOL COMPANY
5820 South Alameda Street, Los Angeles 58, California
405 McCarty Street (P. O. Box 2575) • Houston, Texas
CABLE ADDRESS: MACTOOL
EXPORT OFFICE: Los Angeles, California
CANADA: Edmonton, Calgary, Grande Prairie, Alb.; Regina, Saskatchewan
VENEZUELA: United Oilwell Service Co., S.A.; Caracas, Anaco, Maracaibo

SERVICE LOCATIONS: TEXAS: Houston, Snyder, Alice, Cisco, Corpus Christi, McAllen, Odessa, Tyler, San Angelo, Victoria, Wichita Falls, Luling, Beaumont, Sherman, Midkiff, El Campo. **OKLAHOMA:** Oklahoma City, Guymon, Healdton, Hominy, Wewoka. **ARKANSAS:** Magnolia. **MISSISSIPPI:** Laurel. **NEW MEXICO:** Hobbs. **KANSAS:** Great Bend. **WYOMING:** Casper, Cody, Newcastle. **CALIFORNIA:** Los Angeles, Avenal, Bakersfield, Ventura. **LOUISIANA:** Houma, Lake Charles, New Iberia, Shreveport. **COLORADO:** Sterling. **NORTH DAKOTA:** Williston. **UTAH:** Vernal.

WORLD PETROLEUM for February, 1954. Vol. 25, No. 2. February, 1954. WORLD PETROLEUM is published monthly by Mona Palmer, Trustee under the will of Russell Palmer, 604 Fifth Ave., New York 20, N. Y. Acceptance at East Stroudsburg, Pa., under Section 34.64 P. L. & R. Authorized. Subscription rate: $5.00 per year, single copies $1.00.

Copyright 1954, by Mona Palmer, Trustee.

This DATA may solve YOUR piping problem



● Here is the up-to-date story of Yoloy Continuous Weld Pipe—a remarkable low alloy steel whose nickel-copper content gives it unique ability to withstand corrosion, abrasion and shock. These outstanding advantages combined with high strength, ductility and weldability make Yoloy Pipe an excellent selection.

Proved by 18 years of satisfactory performance, Yoloy is highly recommended by users in such service as radiant heating, snow melting, gas line gathering, brine lines and other industrial piping.

This new folder presents the facts and figures on Yoloy's physical and chemical properties, with data on sizes now available and other information you'll need to select Yoloy Continuous Weld Pipe to meet your special requirements. Write for a copy today.

Youngstown

QUALITY
YOUNGSTOWN
SERVICE

THE YOUNGSTOWN SHEET AND TUBE COMPANY

Manufacturers of Carbon, Alloy and Yoloy Steel

General Offices — Youngstown 1, Ohio

Export Office - 500 Fifth Avenue, New York

COLD FINISHED CARBON AND ALLOY BARS · ELECTROLYTIC TIN PLATE · COKE TIN PLATE · WIRE · PIPE AND TUBULAR PRODUCTS · CONDUIT · RODS · SHEETS · PLATES · BARS · RAILROAD TRACK SPIKES

Oil helps him serve your table . . .

The food in the sea is worth millions and it's there for the taking. But to take it you have to be tough, bold, skilled. You have to work with a slippery, fish-filled deck under you and a pitching sea under that. You have to know the way of the water and the way of your catch.

For centuries, the fisherman's power was in the wind. Today, it's in his mighty, oil-lubricated Diesel or gasoline engine. Result: his job is safer, his payload bigger. America's annual seafood haul now stands at well over four billion pounds. The Texas Company has long been an important contributor of petroleum products to America's fishing industry.

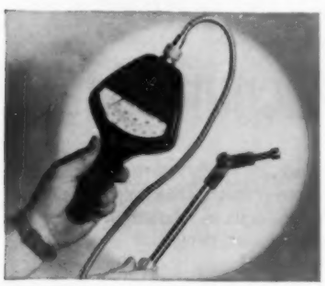
The Texas Company

TEXACO

Use General Electric Industrial-Testing Instruments For Low-Cost Maintenance, Rapid Production Testing

New G-E Leak Detector Finds Costly Leaks Fast

Eliminates long immersion or storage tests. This gun-type detector indicates leaks *directly* . . . in joints, seams, valves. Type H-1 detector finds leaks as small as 1-oz. in 100 years; can be used on any enclosure into which a halogen gas or halogen gas compound can be introduced as a tracer.



G-E Hand Pyrometer Saves Money, Does Work of 2 Instruments

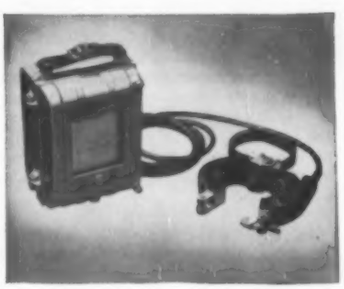
Whether you measure surface, liquid, gas or molten-metal temperature . . . count on this pyrometer to eliminate wasteful temperature *guessing*. This unit has 2 ranges: 0-500 and 0-1500 F. Your operator needs only *1* instrument, choosing either range with a simple control switch.

G-E Hook-on Volt-ammeter Cuts Testing Time

This compact instrument gives you a-c ampere readings *directly*, without cutting into conductors and interrupting service. Just hook onto the conductor —insulated or not—and push to close. Leads are supplied for voltage measurement. 5 current ranges (0-7.5/30/75/300/750 amps) and 3 voltage ranges (0-150/300/750 v). In addition, this G-E Hook-on Volt-ammeter *indicates motor-starting currents.*

G-E Inkless Recorder is Portable, Convenient

This instrument gives you legible records over an extended period of time. It runs as long as 30 days without attention. No clogged pens, no spilled or blotted ink. May be mounted outdoors in weatherproof case. Available in a-c or d-c voltmeters, ammeters and wattmeters. Accuracy is within 2% for all inkless recorders.

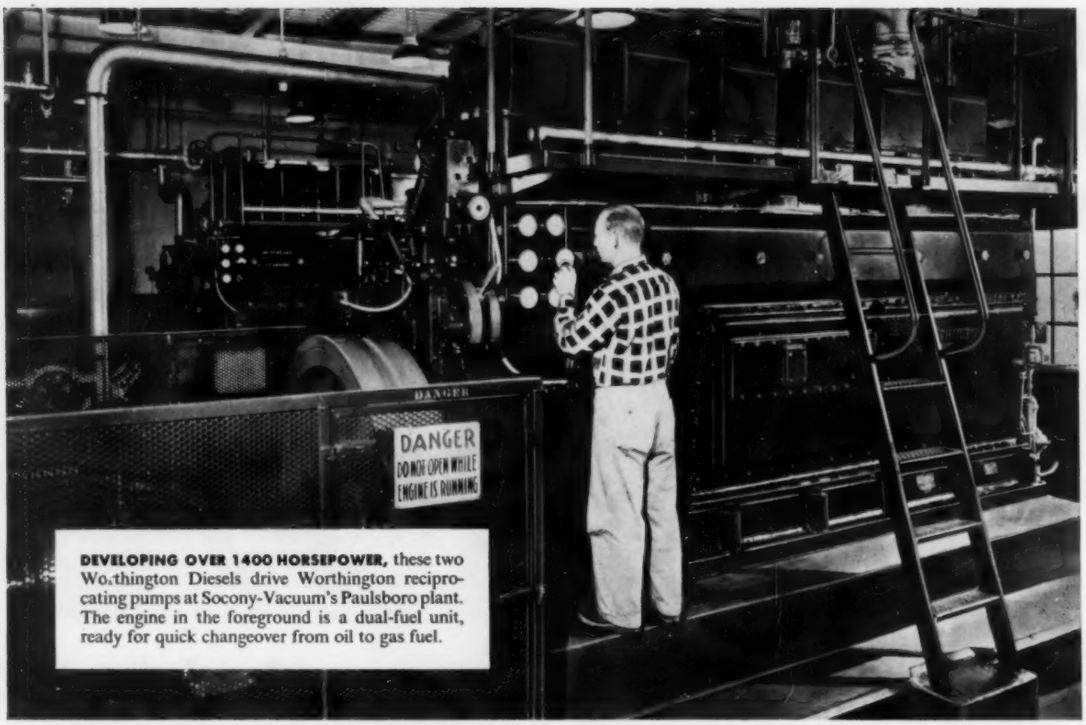


In G.E.'s complete line of meters and instruments, you'll find those that fit your needs. What's more, they save you time and money, too. See your G-E representative for more facts. Or write International General Electric Co., Apparatus Sales, 570 Lexington Ave., New York 22, N.Y., U.S.A.

NYA-129A

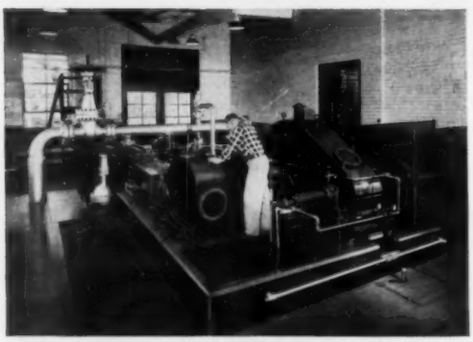
GENERAL ELECTRIC

U.S.A.



DEVELOPING OVER 1400 HORSEPOWER, these two Worthington Diesels drive Worthington reciprocating pumps at Socony-Vacuum's Paulsboro plant. The engine in the foreground is a dual-fuel unit, ready for quick changeover from oil to gas fuel.

Worthington Diesels power pumps along Socony-Vacuum line



DRIVING WORTHINGTON RECIPROCATING PUMPS like this one at the Paulsboro station is the job that Worthington engines along Socony's pipeline do with complete dependability. At the McCrea, Pa., booster station—midway along the line—continued pumping depends entirely on the driving power of a single Worthington Diesel, since no standby unit is used.

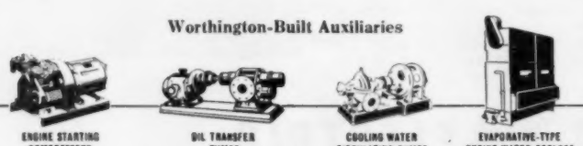
From their refinery at Paulsboro, New Jersey, through a booster station at McCrea, Pa., the Socony-Vacuum Oil Company pumps refined oil products across Pennsylvania to Pittsburgh.

Three Worthington Diesels—two at Paulsboro and one at McCrea—furnish all the power for driving the pumps on this 300-mile pipeline.

Socony-Vacuum's long, satisfactory experience with these dependable and efficient Worthington engines is duplicated by pipeline companies everywhere. Users know that when they buy Worthington dual-fuel Diesels they're getting the most for their dollar. The ability of the Worthington dual-fuel units to operate on crude oil from the line, Diesel oil, gas, or any combination of gas and oil, assures economical operation under all conditions.

Get all the facts on Worthington Diesels, dual-fuel or gas engines. Write to Worthington Corporation, Export Dept., Section E.3.4, Harrison, N. J., U.S.A. E.3.4

Worthington-Built Auxiliaries



ENGINE STARTING COMPRESSORS · OIL TRANSFER PUMPS · COOLING WATER CIRCULATING PUMPS · EVAPORATIVE-TYPE ENGINE WATER COOLERS

Economical Continuous Power—Diesels, Oil and Dual Fuel, and Spark-Ignition Gas Engines, from 150 to 2100 bhp.

WORTHINGTON
Engines

We're mighty interested in the new baby

Each time a new car is announced, the manufacturer who produced it is as proud as a new papa. And refiners, too, are interested, because they have a vital stake in keeping these new babies running just as they left the showroom.

What will be the fuel or lubricant requirements of the new arrival? What are its octane requirements, and what will they be as it grows older?

To help answer these questions, whenever it appears that a new car will have a new or modified engine, the Ethyl Research Laboratories in Detroit obtain several of the early production models for test purposes.

They are carefully given a recommended break-in, then road-tested for octane requirement as clean engines. Additional mileage is then accumulated in order to measure changes in this requirement as the car grows older.

Not only do we test these new cars ourselves in cooperation with the manufacturers, but we make them available to refiners who want to test their own products in them.

This new-car-requirement program is only a small part of Ethyl's research activity. But it's another example of the many services you get when you buy "Ethyl" antiknock compound.

ETHYL CORPORATION, New York 17, N. Y.

Ethyl Antiknock Ltd., in Canada

How THE NATION'S LEADING PIPELINES USE PHILCO *MICROWAVE*

Philco Microwave is being used daily by the Nation's leading pipeline companies. These pipeline companies have selected microwave because: (1) it is an economical, reliable and expandable communications system eliminating costly and vulnerable wire lines, and (2) it provides them with private, dependable communications over long distances, cutting maintenance costs to a minimum.

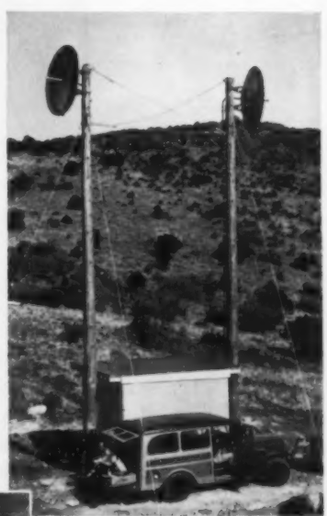
Pipelines stretching over hundreds of miles can be operated and controlled from a single point by microwave. Pressure, rate of flow and tank level readings can be recorded automatically and relayed to headquarters or various points along the route. Philco Microwave carries telephone, teletype, control and telemetering channels . . . *and offers complete tie-in with VHF two-way radio systems and existing wire line facilities.*

Shown here are two of the many Philco Microwave systems that provide the nation's leading pipelines with modern and efficient communications.

From this central console headquarters at Kansas City, Missouri the entire Platte pipeline and communication system can be controlled and monitored.

Platte Pipe Line Company's microwave system is over 1000 miles long . . . to provide every communication and control facility: voice channels, remote supervisory control, continuous or selective telemetering, teletype, alarm signaling and VHF radio. This entire microwave system was surveyed, designed and installed by Philco.

TYPICAL PHILCO PIPELINE INSTALLATIONS



El Paso Natural Gas Company has 500 miles of Philco Microwave with an average distance of 50 miles between stations. This New Mexico to Arizona system consists of repeater and terminal stations, multiplexing equipment for system party line and VHF radio channels.

The longest microwave hop in the nation is this 81-mile El Paso hop from Mount Elden to Dilkon, Arizona . . . typical of the utilization of terrain advantage by Philco.

OTHER INDUSTRIES USING PHILCO MICROWAVE

Communication companies use Philco Microwave for telephone, telegraph and television transmission. Reliability, economy and quality of transmission make Philco Microwave ideal for their use.

Philco Microwave is being used by leading railroads for telephone, telegraph and train dispatching. Microwave is a private system, saves costly wire installations and simplifies right-of-way problems.

Utilities rely on Philco Microwave for the control of power stations, dispatching of repair trucks and communication. Dependable channels, unaffected by adverse weather, are a necessity for utility use.

For Complete details, write to Dept. WT Today!

PHILCO *Famous for* QUALITY *the World Over*

PHILCO CORPORATION

GOVERNMENT & INDUSTRIAL DIVISION PHILADELPHIA 44, PA.

WHY PHILCO MICROWAVE is IDEAL for PIPELINES

• RELIABILITY

Philco leads the industry in the supply of microwave equipment. It is the choice of industry and the Armed Forces . . . and for good reason. Joint Army-Navy specified components are used wherever applicable. Philco "Power House" klystrons have remained in operation for more than 20,000 hours in many installations. Highest quality components plus dependable design assure long, trouble-free operation.

• ECONOMY

Philco Microwave is designed to operate at lowest cost. Shelter-mounted antennas and tower reflectors eliminate costly, power-consuming feed lines. Philco equipment design provides the highest power output, insuring reliable, low cost communication over the longest hops.

• FLEXIBILITY

Philco Microwave design permits future expansion of facilities by the simple addition of pre-packaged, pre-tuned subassemblies. Each of the 24 voice channels in Philco multiplexing equipment is capable of being subdivided into 16 additional channels for telemetering, teletype, supervisory control and other uses. Convenient tie-in to existing wire or VHF facilities greatly increases utility.

• ACCURATE SURVEYS

The first step to reliable, economical microwave communications is an accurate right-of-way survey. Philco Survey Engineers have broad experience in microwave surveys and will plan your microwave system for your present and future needs at the lowest possible cost.

• SYSTEMS PLANNING SERVICE

Philco has an experienced systems planning group for consultation and assistance to aid in tailoring a microwave system to meet your specific needs. These engineers will recommend dependable, low cost microwave systems that incorporate flexibility for future expansion. This service covers entire systems including associated equipment such as control consoles, telemetering, teletypewriters, telephones, VHF radios, and other types of equipment.

• INSTALLATION, MAINTENANCE AND TRAINING

Philco can install or supervise the installation of your entire microwave system and maintain your system during initial operation. Philco can also train your personnel as they have trained thousands of technicians and maintenance men in the operation of its equipment. Only Philco can give you an operating microwave system complete with every necessary equipment and service. Write today for full information.

Washington PIPE LINE

By Joseph B. Huttlinger

THE CROP OF LEGAL ASSAULTS ON petroleum seems never to fail, whatever happens in other fields of activity. Between the Department of Justice, Federal Trade Commission and other governmental agencies, oil and gas in some of its divisions is being constantly pulled hither and yon. Old suits hang on from year to year without reaching settlement and there are intimations that even more court actions may be expected before the year is much older.

For example, there is the so-called "oil cartel" case in which five American corporations and two foreign companies were accused of price fixing agreements in their international operations. It was a *cause celebre* year before last and filled many columns of newspaper space amid accusations that the administration then in power had started it as a vote-catching political move. Begun as a criminal suit, it was transposed to a civil action and limited to the American defendants after the foreign companies, backed by their governments, had declined to submit the records demanded in the complaint. Not much has been heard about the case for many months, but it is still extant. Latest report was that Judge P. C. Knox of the federal district court of Southern New York was to name a judge to hear the civil case, but further delay may result from the appointment of a 60-man commission by Attorney General Brownell to survey the whole subject of anti-trust laws including their application to firms operating abroad.

Then there is the celebrated Tidelands controversy, a particularly live issue for seven years after the Supreme Court had decreed that the national authority over offshore waters was paramount. It was supposed to have been disposed of when Congress relegated to the states control of offshore waters up to the "historic limits" of their boundaries. Since then, however, the validity of the legislation has been challenged by several states, Rhode Island being the latest entrant as a litigant. There is general expectation that the courts will dismiss the charges; otherwise the whole issue will be thrown open to years of legal skirmishing and development of marine exploration will be correspondingly delayed.

Most complete example of the *snafu* created by the crossing of wires by official agencies is the present situation in the field of natural gas. The issue here arose from interpretation of an act of Congress passed in 1938 authorizing the Federal Power Commission to regulate rates for natural gas transported for resale in interstate commerce. The legal question involved is whether this authority applies to a gas producer who is not engaged in interstate transportation. In a suit involving this question a Court of Appeals held that the FPC could determine the intrastate price of gas because of its indirect effect on interstate operations. In a recent order the Supreme Court refused to review the order of the lower court, but on January 18, in a surprise reversal of its position, the Court decided by a vote of eight to one to grant a rehearing.

Such a change of position after the judges have announced a decision is almost without precedent and has given rise to much speculation as to whether their next pronouncement will be based on purely legal technicalities involved in the appeal or whether it will attempt to define the exact limits of the Federal Power Commission's control over gas prices. Unless the latter course is taken, another act of Congress may be required to untangle the snarl in which the whole matter is enmeshed and to clear the way to normal development of the nation's gas resources. Bills to accomplish this have been proposed, but no Congressional action is likely until the Supreme Court has spoken, and this may put the whole subject over until another session.

Earlier the high tribunal decided that a state minimum price for natural gas in the field which might interfere with such federal regulation cannot be forced upon a gas company. This was in the Northern Natural Gas Co. case.

In the marketing field a state of confusion has resulted from conflicting positions adopted by federal law-enforcing agencies. If uniform prices prevail in a certain state or district, all the companies operating in the area are likely to find themselves under indictment for violation of the anti-trust act, while if a company cuts prices to meet competition it may be assailed by the Federal Trade Commission for unfair business practices.

In Philadelphia, The Sun Oil Co. is the target of a government charge that it forces exclusive dealing illegally upon its outlets.

On the West Coast, a broader suit against seven major companies has been filed.

The Federal Trade Commission is "conducting investigations" to see if some petroleum companies in other locations require exclusive dealing on the part of distributors in violation of the law. If it finds they do, crackdowns may come, it says.

More suits are under study. The Justice Department says it has 10 percent of its attorneys working on petroleum cases. They are studying the price leader theory as a possible violation of antitrust laws, it is known.

Flank attacks are on against clearly legal activities. Thus, the National Petroleum Council is under fire. And the crude oil proration system, 19 years old, is being eyed as a possible target.

This whole maze of confusing and conflicting policies and procedures in government relations with business points up the urgency of overhauling the whole system of so-called anti-trust legislation, now long overdue. The Presidential-supported commission which is studying the laws, with a view to bringing them up to date, may contribute something to their clarification within a few months.

Get maximum traction anywhere, anytime!

INTERNATIONAL 4-WHEEL DRIVE TRUCKS

Haul men, tools and equipment to any job . . . through ruts, mud, sand or snow . . . over terrain where conventional trucks can't go. Do *all this* with an International medium-duty four-wheel drive truck!

Two new International 4x4 models now offer you an important development in transportation efficiency. They're tough-job engineered, they're built for the hardest kind of work. Model R-140 (4x4) has a gross vehicle weight rating of 11,000 pounds, the R-160 (4x4) is rated at 15,000 lbs. GVW.

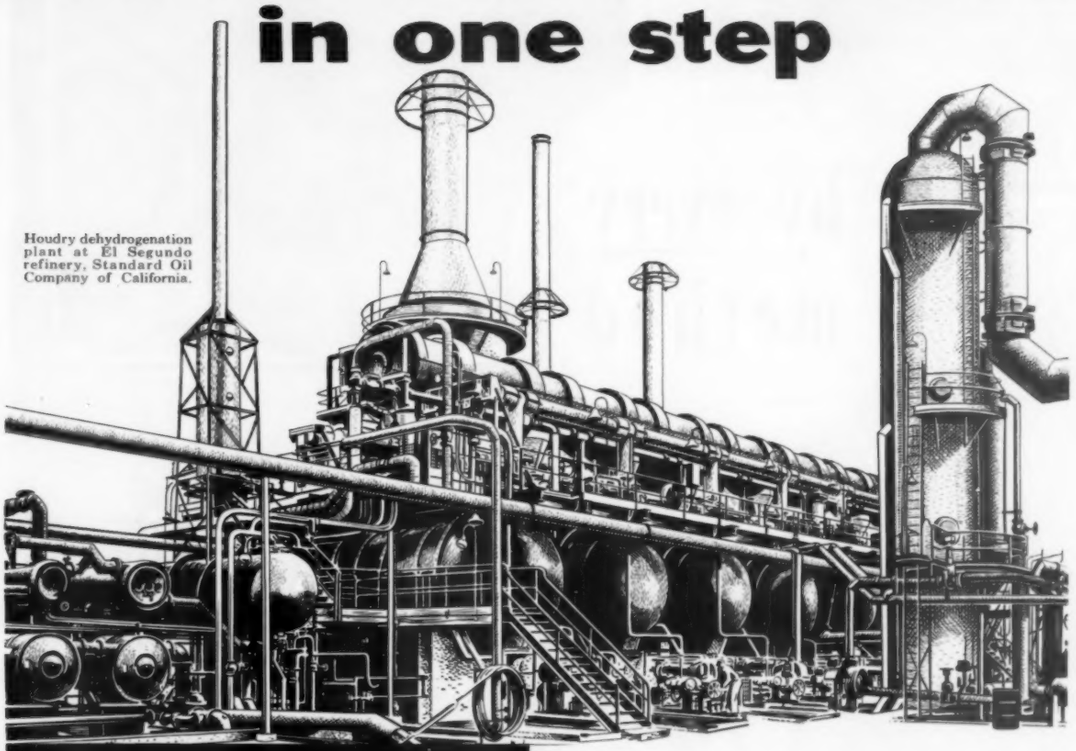
Each comes in two wheelbases, and each is available with single front and dual rear tires, or large-section single tires all around. With front axle disengaged, these International 4x4's operate normally on hard-surface roads.

Here is real stamina and versatility for the difficult hauling jobs. Find out more about the new International 4x4 models from your International Distributor now. International Harvester Export Company, 180 N. Michigan Ave., Chicago 1, U.S.A.

INTERNATIONAL TRUCKS

Better Living through Better Roads

BUTADIENE
from
NORMAL BUTANE
in one step



Houdry dehydrogenation plant at El Segundo refinery, Standard Oil Company of California.

HOUDRY

PROCESS CORPORATION

1528 Walnut Street, Philadelphia 2, Pa.

PIONEER IN CATALYTIC PROCESSES

Ten years experience in a large commercial installation has proved the economic advantages of this process for producing butenes or butadiene from low-cost, plentiful butane.

The Houdry Dehydrogenation Process is applicable also to the production of propene from propane, isobutene from isobutane, styrene from ethyl benzene, and methyl styrene from isopropyl benzene.

Write on your letterhead for brochure describing Houdry Dehydrogenation Process; economics and flow diagram are included.

INTERNATIONAL LICENSORS: WORLD COMMERCE CORPORATION, S. A.

25 Broad Street, New York 4, N. Y. With Representatives In:

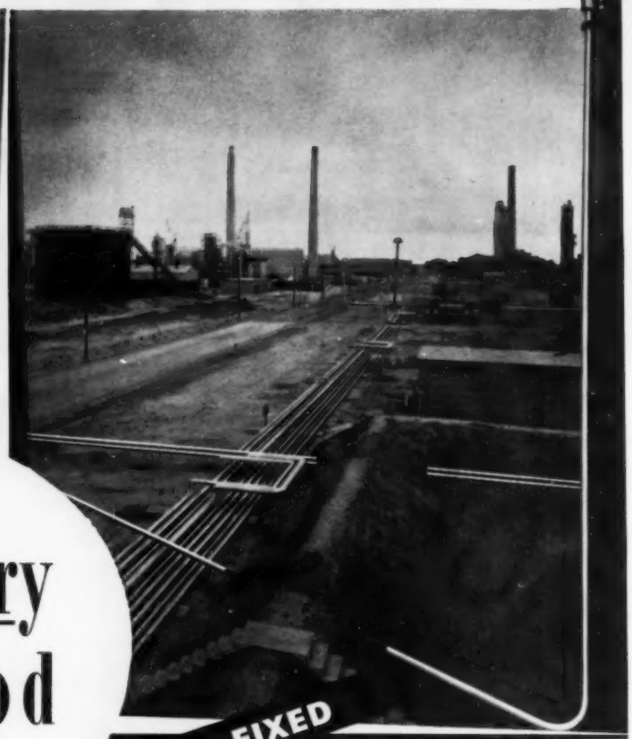
BRAZIL ENGLAND FRANCE

GERMANY ISRAEL ITALY JAPAN

PANAMA SPAIN SWITZERLAND

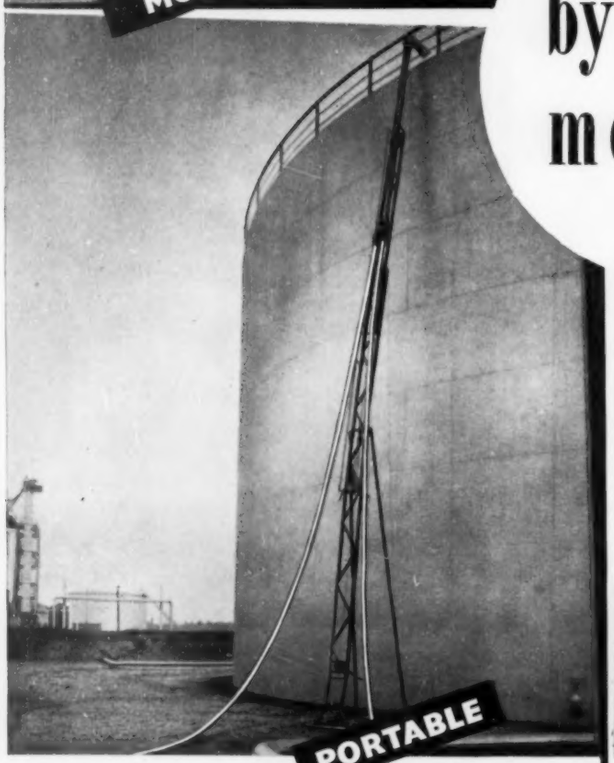
Fire Protection for the Oil Industry

MOBILE



FIXED

by every method



PORTABLE

FIRST AID

MOBILE. Pyrene Mobile Foam CO_2 Fire Tenders are the most advanced fire-fighting vehicles of their kind and are today's answer to major fire dangers in refineries and tank farms. They are designed and equipped to meet specialized requirements. There is also a range of Pyrene Mobile Foam Trailers.

PORTABLE. Pyrene Portable Foam Towers are made to facilitate the application of foam to floating roof tanks or normal storage tanks having fractured roof plates. This equipment is readily manoeuvred and erected by four men. Fitted with self-sustaining winch and foam pourer. Maximum extension 50 feet.

FIXED. Where oils or spirits are stored in bulk, one or other of the various types of fixed Pyrene Mechanical Foam Installations provide the highest degree of practical fire protection. Pyrene specialized equipment in this field is of maximum efficiency, the outcome of many years of experience, and research.

FIRST AID. The Pyrene Company provide the widest range of hand fire extinguishers, designed to meet every class of fire risk throughout the refinery area including laboratories, electrical plant, and office buildings. The range includes Pyrene Fire Extinguishers, CO_2 Extinguishers, CO_2-Dry Chemical Fire Extinguishers, "Phomene" Foam Fire Extinguishers, "Conquest" Soda-acid and Water type Extinguishers.

Pyrene TRADE MARK FIRE FIGHTING EQUIPMENT

The free and impartial advice of Pyrene Fire Engineers is always available to assist you with your fire problems, or illustrated literature will gladly be sent on request to Dept. WP. 2

VICtoria 3401 Cables: "Pyrene-London" **THE PYRENE COMPANY LTD.,** *9 Grosvenor Gardens, London, S.W.1., England*

THE *All-Bethlehem* DRILLING RIG

A workhorse with *get-up and go*

Each of the many components in a Bethlehem turnkey drilling rig embodies the latest advances in engineering – something very important, in view of the loads imposed by modern drilling. And all the components are designed for top performance at any speed. A Bethlehem rig gives you "balanced" operation – harmony and smoothness from crown block to drill bit. There are no mismatched elements anywhere.

You'll find that Bethlehem equipment is conservatively rated, with more than ample reserve for peak demands. You'll find, too, that a Bethlehem rig is a workhorse, one that requires no coddling; one with *go* from the minute you start the engines.

So next time make it an all-Bethlehem outfit – Bethlehem drawworks, slush pumps, swivel, rotary – everything. We have the proper rigs for shallow, medium, or deep-hole drilling, whichever your needs call for. Write for information; complete details will be sent promptly.

In addition to its full line of drilling equipment, Bethlehem manufactures a wide range of pumping units for production work.

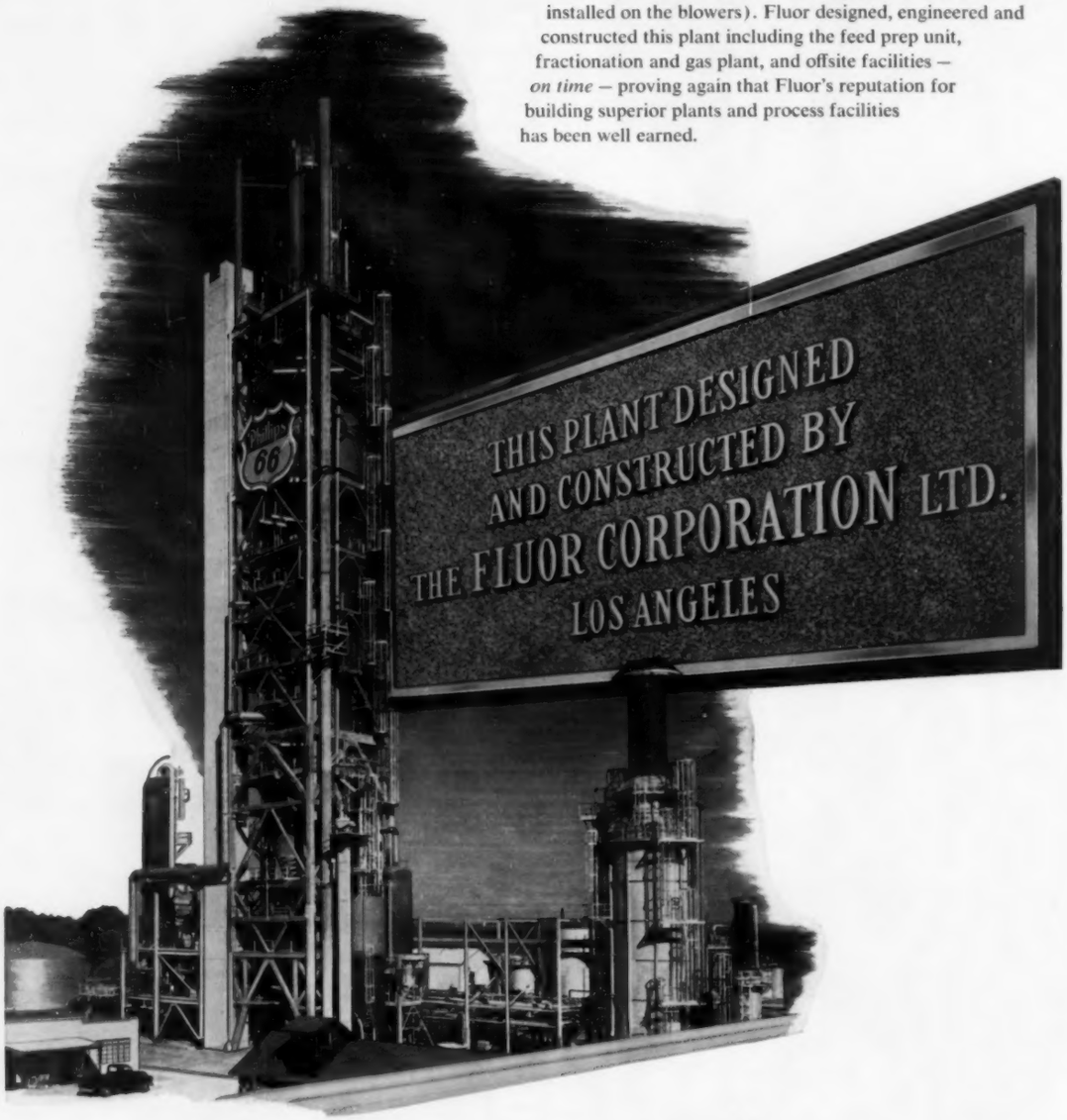
BETHLEHEM STEEL

BETHLEHEM STEEL EXPORT CORPORATION

25 Broadway, New York 4, N.Y., U.S.A.

Cable Address "BETHLEHEM, NEWYORK"

OKMULGEE, OKLAHOMA This Thermofor Catalytic Cracker recently went on stream at the Phillips Petroleum refinery, here. Although similar to the TCC unit built simultaneously by Fluor for Phillips at Woods Cross, Utah, this unit incorporates several innovations: it was one of the first of the airlift type which can use any type of pelleted catalyst, it is the first to employ a vacuum unit that is directly integrated with the cat cracker, and was the first to be silenced (silencers were installed on the blowers). Fluor designed, engineered and constructed this plant including the feed prep unit, fractionation and gas plant, and offsite facilities — *on time* — proving again that Fluor's reputation for building superior plants and process facilities has been well earned.



BE SURE WITH **FLUOR**

THE FLUOR CORPORATION, LTD
LOS ANGELES 22, CALIFORNIA

FOREIGN: FACTS-FLUOR · PARIS
FLUOR OF CANADA · TORONTO
FLUOR INTERNATIONAL · BEIRUT
FLUOR PERUANA, S.A. · LIMA
HEAD WRIGHTSON · LONDON

ENGINEERS
CONSTRUCTORS
MANUFACTURERS

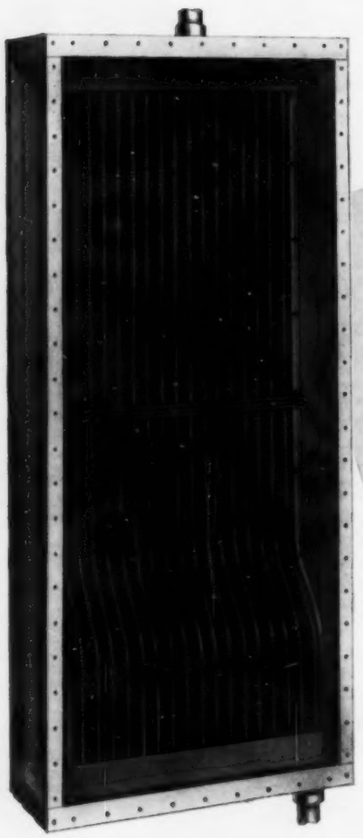
NEW YORK
CHICAGO
PHILADELPHIA
BOSTON
PITTSBURGH
SAN FRANCISCO
HOUSTON
BIRMINGHAM

Mail

Hundreds of thousands of pieces of mail for Arabian American Oil Company employees are handled each year at ARAMCO's Dhahran, Saudi Arabia, mail center. The mail clerks are kept mighty busy distributing letters to people of twenty different nationalities who work together developing Saudi Arabia's vast oil resources.

Aramco THE ARABIAN AMERICAN OIL CO.
DHAHRAN, SAUDI ARABIA NEW YORK, U.S.A.

EFFICIENT *Extended-Surface* HEAT EXCHANGERS



for

Heating
Cooling
Process
Air Conditioning

ASK THE AEROFIN MAN

Your Aerofin man's recommendation means high efficiency, long service life, low maintenance costs.

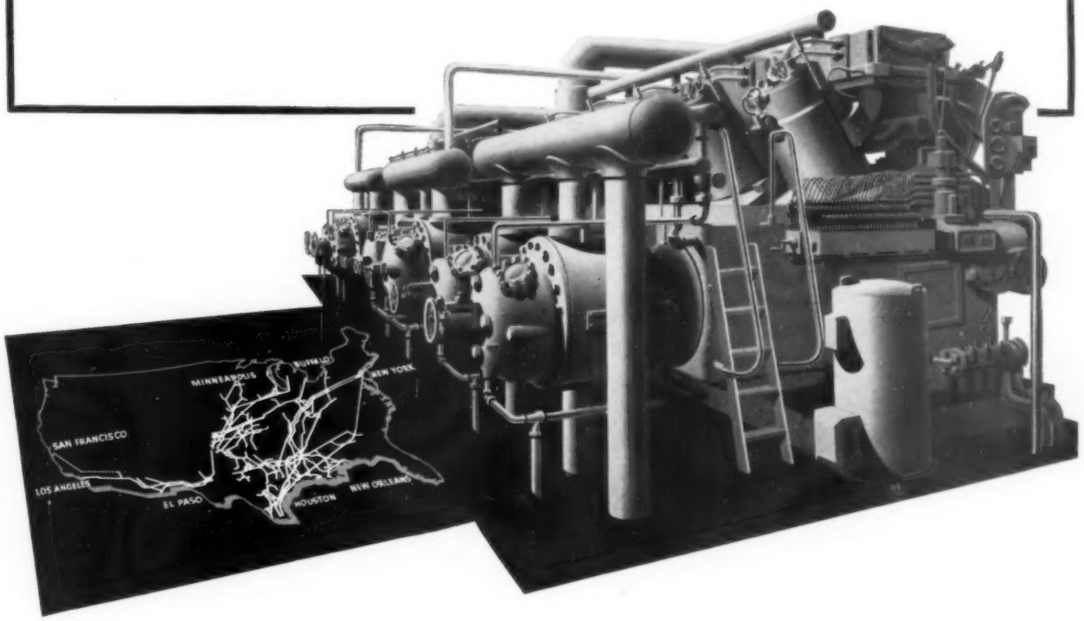
Aerofin's unequalled laboratory and manufacturing facilities — unequalled knowledge of heat-exchange practice — are devoted exclusively to the design and manufacture of highest quality extended heat surface.

Aerofin is sold only by manufacturers of fan-system apparatus. List on request.

AEROFIN CORPORATION
410 South Geddes St., Syracuse 1, N. Y.

GULF SECURITY OIL

provides better lubrication
for pipe line compressor units,
helps prevent operating troubles



Here's the lubricant you can depend on to help keep your pumping stations operating smoothly and continuously—Gulf Security Oil. It provides effective protection for cylinders and bearings in both engines and compressors.

Because of its excellent resistance to oxidation, Gulf Security Oil stands up for many hundreds of hours without any appreciable change in its original properties. After years of operation with this quality lubricant, equipment shows remarkable freedom from cylinder wear and a minimum of carbon deposits on valves and rings. And because oil control rings are kept clean, oil consumption is remarkably low.

Operators of the many units lubricated with Gulf Security Oil report that this quality lubricant helps them get more operating hours between overhauls, and avoid unscheduled shutdowns.

For additional information on Gulf Security Oil and for the services of a Gulf Sales Engineer, get in touch with your nearest Gulf office today. Write, wire, or phone.

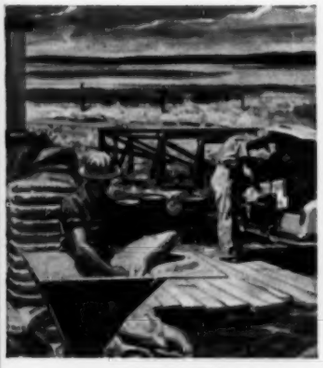
Gulf Oil Corporation · Gulf Refining Company,
Pittsburgh 30, Pennsylvania.

GULF INDUSTRIAL LUBRICATION

AN ADVERTISEMENT OF WHESSOE LIMITED • DARLINGTON • TELEPHONE: 5315 (5 lines) • LONDON OFFICE: 25 VICTORIA STREET • LONDON • SWI • TELEPHONE: ABBEY 3881

DRESSER
MANUFACTURING DIVISION
IS ONE OF THE DRESSER INDUSTRIES

Dresser Manufacturing Division has grown up and expanded with the gas and oil industries. Dresser Couplings, the first leakproof pipe joints, made possible the high pressure transmission of gas over long distances. Dresser's complete line of couplings, repair clamps and sleeves, and welding fittings are specially designed to meet requirements of these industries.



MAGNET COVE BARIUM CORP., Houston, Tex., Malvern, Ark. Magcobar drilling mud, Magcogel bentonite, Mylojel, Fiber Seal, Jel-Oil mud.

CLARK BROS. CO. DIVISION, Olean, New York. Engines and compressors—gas, steam and diesel driven.

DRESSER MANUFACTURING DIVISION, Bradford, Pa. Oil and gas pipe couplings, fittings and sleeves—rolled and welded rings—welded fittings and flanges.

KOBE, INC., DIVISION, Huntington Park, Calif. Complete hydraulic oil field pumping systems, including the Kobe Free Pump.

No. 3 in a series about Dresser Industries

What is the DRESSER plus+?

The Dresser Plus is the extra *service* you get when you deal with any Dresser company. It is an added advantage for you which stems from Dresser's unique overall organization. For Dresser is many companies with a single purpose—to provide the growing oil and gas industries with operating equipment that is *second to none.*

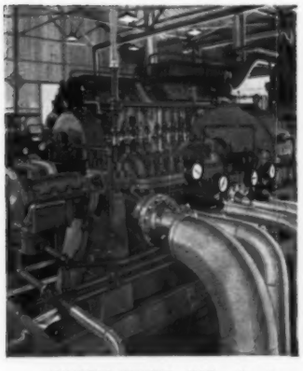
Each company in the Dresser group functions independently within its own specialized field—yet each can draw from the total resources, in manpower, research, and know-how, of the combined Dresser operations. When you work with any of the Dresser companies, all of the facilities of Dresser are *at your service.*

Planned, coordinated specialization—company by company—"one for all and all for one"—that is the DRESSER PLUS +

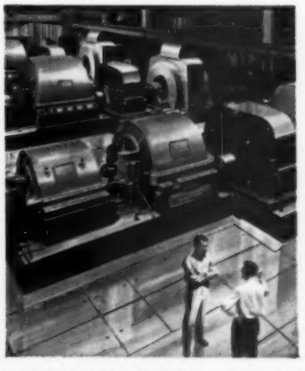
Gas utilities and pipelines use Dresser Products as standard practice in the installation and maintenance of their underground lines. In the oil fields, Dresser Couplings and long sleeves are widely employed on pipelines, field and tank connections, machinery and equipment hookups. DRESSERTAPE is a new plastic coating for the protection of pipe against corrosion.

DRESSER INDUSTRIES, INC.
OIL, GAS AND CHEMICAL EQUIPMENT

ATLANTIC BUILDING ★ DALLAS, TEXAS



PACIFIC PUMPS, INC., Huntington Park, Calif. Centrifugal pumps, deep oilwell plunger pumps, hot oil and boiler feed pumps.



ROOTS-CONNERSVILLE BLOWER DIVISION, Connersville, Ind. Rotary positive blowers, gas pumps, centrifugal blowers, exhausters; positive displacement meters.

SECURITY ENGINEERING DIVISION, Whittier, Calif., Dallas, Tex. Rock bits, reamers, casing scrapers, reamer rock bits, coring bits, Securaloy.

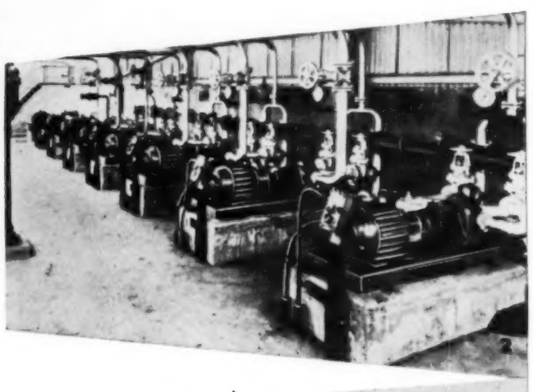
IDECO DIVISION, Dallas, Beaumont, Tex. Derricks, drawworks, rambler drilling rigs, traveling blocks, rotary tables.

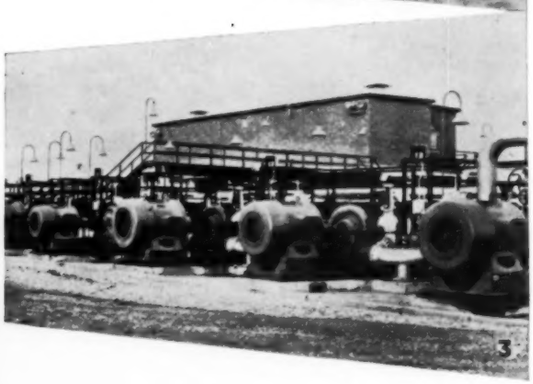
FLAMEPROOF MOTORS

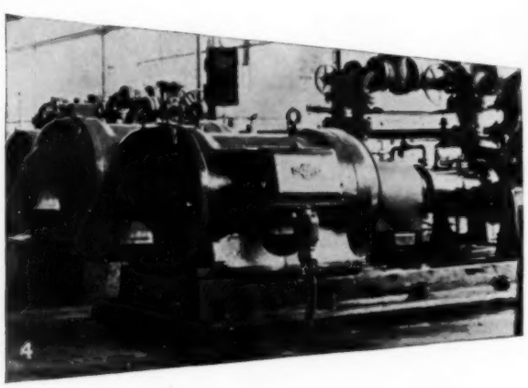
certified for group 2 and group 3 gases

A complete range of Metrovick Buxton-certified flameproof motors is available for refineries and petro-chemical works, for either indoor or outdoor use. Machines with either ball and roller bearings, or sleeve bearings, can be supplied, and all are suitable for hot product pumps.

A specialised range of splash-proof well-pump motors and industrial type machines for non-hazardous locations is also available.







1. A range of flameproof motors in one of the main pumping stations at Scottish Oils, Grangemouth Refinery. 2. Type KFB flameproof motors driving Sigmund pumps at Shell Stanlow Refinery. 3. 300-600 hp outdoor flameproof motors at the product loading station at Esso Refinery, Fawley. 4. 125 hp 3500 rpm T.E.F.C. motors driving oil pumps at Trinidad Leaseholds Pointe-a-Pierre Refinery, British West Indies.

METROPOLITAN-VICKERS ELECTRICAL COMPANY LIMITED
Member of the A.E.I. group of companies
TRAFFORD PARK · MANCHESTER, 17

METROVICK *Motors Serve the Oil Industry*

Steel plate . . . good design . . . first-class fabrication and welding . . . are synonymous with Whessoe, pioneers in steel plate construction. Whessoe fabricate more than 40,000 tons of steel plate per year. Finished Whessoe products are in the form of storage tanks, spheres, pressure vessels, process plant and steel plate structures . . . contributing to the advancement and growth of the oil, gas, chemical and electric industries.

WHESSOE *DESIGN & CONSTRUCTION IN STEEL PLATE*

AN ADVERTISEMENT OF WHESSOE LIMITED • DARLINGTON • TELEPHONE: 5315 (5 lines) • LONDON OFFICE: 25 VICTORIA STREET • LONDON • SWI • TELEPHONE: ABBEY 3881

W

Fractions SOLVE BIG PROBLEMS

The petroleum industry has made good use of the "divide-and-rule" formula that conquered kingdoms . . . to win command of the giant powers hidden in nature's oil. The industry's process engineers have transformed American life by their mastery of petroleum's secrets . . . and fractionating has been their master key.

These engineers' ability to develop processes which break petroleum into its component fractions has harnessed the "black gold" into a myriad forms of service. There have been other important results, too. The gigantic motor industry . . . America's vast network of modern highways . . . the services to motor travel—these are largely by-products of the petroleum process engineer's knowledge of fractional distillation.

For many years, Sun Ship has been adding to its own prestige by the service and cooperation its great shops give to the petroleum industry, and to the many other industries which call on Sun Ship's versatile engineering and construction skills. It has built . . . for chemical and petroleum process engineers, and for refineries throughout the world . . . the immense fractionating towers, pressure vessels, special machinery and heavy equipment they require. The 95′7″ crude tower shown in the photograph, ready for shipment, is a representative example.

Sun Ship's services will continue to keep pace with the giant strides made by the nation's industries in the engineering progress which is steadily building a greater America.

Sun

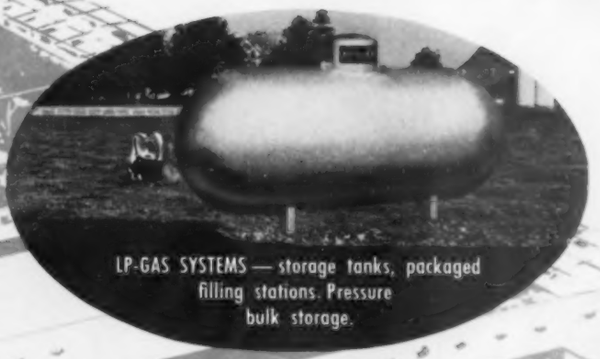
SHIPBUILDING & DRY DOCK COMPANY

ON THE DELAWARE SINCE 1916 CHESTER, PA.

25 BROADWAY • NEW YORK CITY

PACKAGED COMPRESSOR PLANTS — for field gas gathering and boosting, flare gas collection, gas lift and repressuring.

ANHYDROUS AMMONIA TANKS — for truck, trailer and tractor mounting, packaged bulk storage stations.



LP-GAS SYSTEMS — storage tanks, packaged filling stations. Pressure bulk storage.

TRANSPORTS — for L-P Gas and anhydrous ammonia.

CAST STEEL FITTINGS — flanged, screwed, refinery return bend, and pipeline flanges.

PACKAGED LP-GAS STATIONS — for servicing vehicles which use butane or propane for fuel.

PRESSURE STORAGE TANKS — for storing of butane, propane, anhydrous ammonia and other liquefied gases.

SINCE 1918

BEAIRD

SHREVEPORT

MACHINING • MANUFACTURING • STEEL WAREHOUSE

THE J. B. BEAIRD COMPANY, INC.

SHREVEPORT, LOUISIANA

Latest type high conversion UOP Fluid Catalytic Cracking Unit installed at the Denver refinery of The Bay Petroleum Corporation.

MODERNIZATION PROGRAM AT BAY DENVER NEARLY DOUBLES CRUDE CAPACITY

By C. O. Garbrecht, Vice President
The Bay Petroleum Corporation

A sweeping modernization and expansion program completed at a cost of several million dollars at our Denver refinery has enabled it to nearly double its crude capacity while at the same time substantially increasing the overall yield of refined products and greatly improving the quality of those products.

C. O. Garbrecht

Our program, which made the refinery at Denver one of the largest in the Rocky Mountain region, was centered around the installation of the latest type high conversion Fluid Catalytic Cracking unit designed by Universal Oil Products Company. The unit has a design capacity of 3,528 barrels per day of fresh feed stock at 76 per cent conversion. The design coke burning capacity is 3,770 pounds per hour.

Coincidental with construction of the cat cracker the Dubbs thermal cracking unit was converted into a visbreaker-vacuum unit for preparation of cat cracker feed stock. A crude topping unit, gas concentration plant, and a polymerization unit also were redesigned, enabling us to make the maximum use of existing refinery equipment.

Universal Oil Products Company designed and engineered the new cat cracker and redesigned existing equipment, while all construction work was handled by Procon Incorporated.

Crude Capacity 11,000 Bbls.

Through these changes, our refinery at Denver which previously processed 6,000 barrels of crude oil daily now handles 11,000 barrels daily, and it is marketing a premium gasoline which is specifically tailored to meet the requirements of high altitude driving.

In our modernized refinery operation, the converted crude unit processes a blend of Wilson Creek, Wellington, and Lance Creek crude oils. A light straight run gasoline, naphtha, kerosene, Diesel fuel, gas oil and reduced crude are prepared from this blend. The latter material forms the charge to the visbreaker-vacuum unit.

Charge to the visbreaker is cracked lightly on a once-through basis before being discharged into a flash chamber. Vapors which are formed there are fractionated into a gas and gasoline overhead and gas oil bottoms. The gas and gasoline are sent to the cat cracker gas concentration unit for further separation and recovery.

After being heat exchanged against crude and then cooled, gas oil bottoms are sent to storage, where they are picked up along with other gas oil streams. The mixture comprises the feed stock for the cat cracking unit.

Bottoms from the visbreaker flash chamber are vacuum flashed in another tower. Vacuum gas oil is condensed and sent to storage as part of the cat cracker charge stock, while visbroken and vacuum flashed pitch is cut back with cat cracker cycle oil to meet No. 6 fuel oil specifications.

Gas and gasoline produced in the cat cracker undergo further processing in the gas concentration plant, which prepares feed for the revamped poly plant, as well as debutanized gasoline. Excess light gases are vented to the refinery fuel system.

Recoveries Run High.

Recoveries of light end materials from the gas concentration system have been found to be exceptionally high, averaging more than 85 per cent on the propane-propylene fraction and nearly 100 per cent on the butane-butylenes.

The gas concentration unit is divided into four sections—a primary absorber, a secondary absorber, a stripper and a debutanizer. Low pressure gas from the cat cracker receiver is supplied to the primary absorber. Condensate in the cat cracker receiver is the absorption medium for this column.

Gas from the primary absorber is sent to the secondary absorber, whose absorption medium is cycle oil from the cat cracker fractionator. Primary absorber bottoms are stripped before being debutanized. Debutanizer overhead is charged to the revamped poly plant, while debutanizer bottoms are sent to cat cracked gasoline storage.

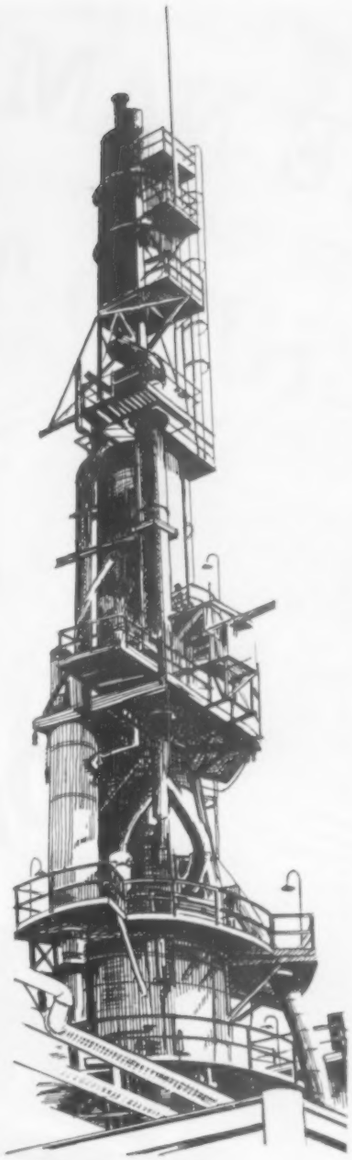
Idle Equipment Used.

Effluent from the poly plant is used as part of the unit's recycle. Because additional heat exchange was needed due to the increase in crude capacity, finned tube sections removed from idle units in the refinery were added to the poly plant.

The poly plant's effluent is depropanized. The net overhead is charged to a de-ethanizer, where LPG is prepared as a bottoms cut.

Depropanized polymer is stripped and excess butane is removed overhead. A 10-pound polymer is produced as a bottoms fraction.

We feel that the constantly increasing demand for our new cat cracked products more than justifies the expenditures we made in modernizing this refinery and making it the finest in Rocky Mountain Area.



New UOP
Fluid Cat Cracker
for Bay Denver

designed, engineered and licensed by

UNIVERSAL
OIL PRODUCTS
COMPANY

30 ALGONQUIN ROAD,
DES PLAINES, ILL., U. S. A.
Laboratories: RIVERSIDE, ILLINOIS

Universal Service
Protects Your Investment

THE NAME BEHIND THE NEWS..

Mobiloil
SOCONY-VACUUM OIL COMPANY, INC.
Made in U.S.A.
World's Fastest Boat— Slo-Mo-Shun IV—averaged 178.49 mph—with Mobiloil!
1953 Pike's Peak Winner— Louis Unser roared to the top in record time—with Mobiloil!
World's Fastest Car— John Cobb's twin-engine auto averaged 394.19 mph. It was Mobiloil-protected.
1953 Indianapolis Race—Winner of this 500-mile classic, Bill Vukovich, used Mobiloil!
1953 Pan-American Road Race— Sports car winner, Juan Fangio, averaged 105 mph—with Mobiloil!

SOCONY-VACUUM OIL COMPANY, INC.

and Affiliates:

MAGNOLIA PETROLEUM COMPANY • GENERAL PETROLEUM CORPORATION

SOCONY-VACUUM

STEELS FOR THE PETROLEUM INDUSTRY

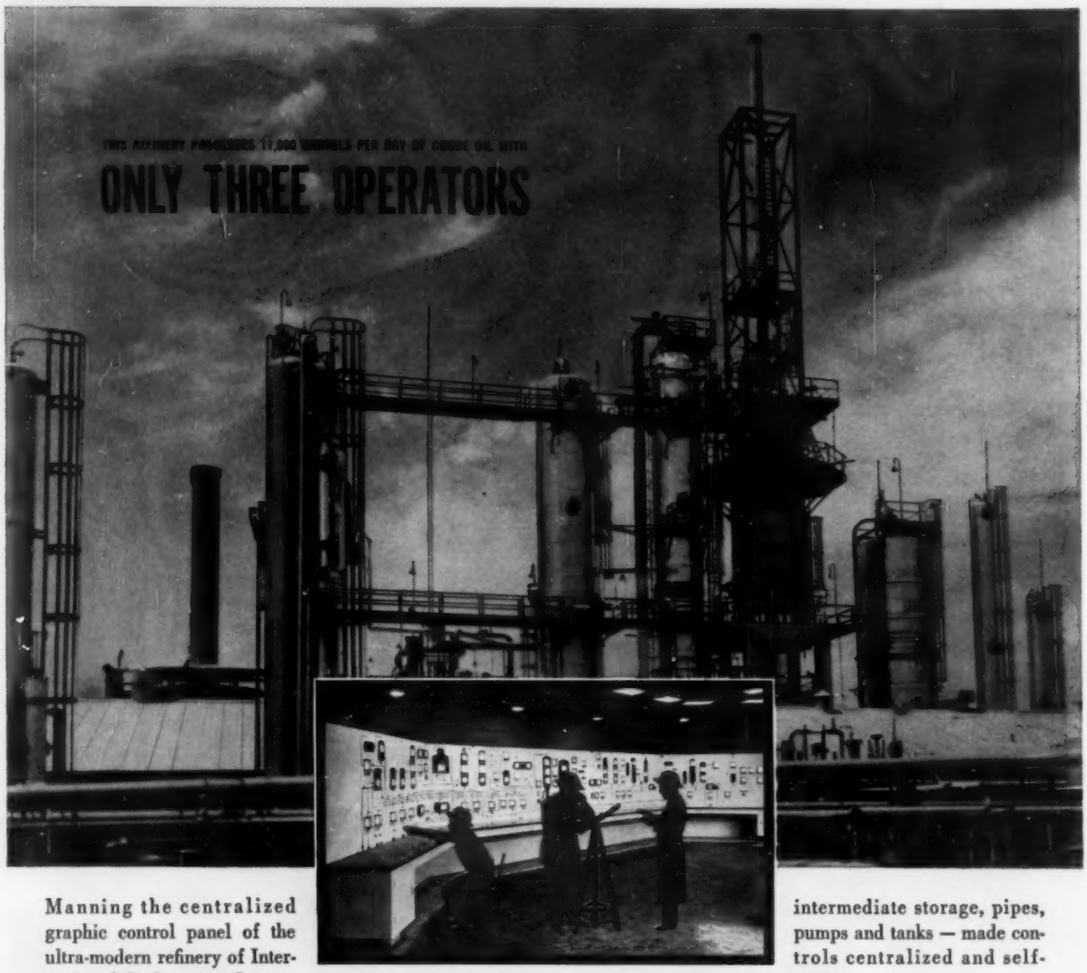
THE UNITED STEEL COMPANIES LTD

This organisation has made a special study of steel requirements of the petroleum industry: plates for fusion welded vessels; constructional steel; forgings; alloy steels, including corrosion and heat-resisting types; etc. The Technical Departments will be pleased to discuss specific applications with manufacturers of petroleum equipment.

THE UNITED STEEL COMPANIES LIMITED OF SHEFFIELD ENGLAND

The Largest Steel Producers in the British Commonwealth

US36



Manning the centralized graphic control panel of the ultra-modern refinery of International Refineries, Inc. at Wrenshall, Minnesota, only three operators per shift completely control the processing of 11,000 B/D of Canadian crude oil.

This outstandingly economical arrangement is indicative of a new concept in refinery design, resulting in a financially profitable small refinery in an area where one had not previously existed.

To meet the special requirements of this situation, we at Lummus combined imagination and process ingenuity with a half century of engineering experience. We integrated Distillation, Model IV Fluid Catalytic Cracking, Gas Recovery, Treating and Catalytic Polymerization into a plant operated as one unit. We made flow of oil continuous, minimizing intermediate storage, pipes, pumps and tanks — made controls centralized and self-acting.

For International, this means a refinery low in initial investment (somewhere around $750 per barrel) and operating costs; one balanced to meet today's needs of the area it serves, but flexible for future changes—a successful solution of their specific problem.

Perhaps this demonstrates how the Lummus approach to a problem may contribute to the success of your next petroleum or chemical project.

THE LUMMUS COMPANY, 385 Madison Avenue, New York 17, N. Y. *Engineering and Sales Offices:* New York, Houston, London, Paris. *Sales Offices:* Chicago, Montreal, Caracas. *Heat Exchanger Plant:* Honesdale, Pa. *Fabricated Piping Plant:* East Chicago, Indiana.

LUMMUS

DESIGNING ENGINEERS AND CONSTRUCTORS FOR THE PETROLEUM AND CHEMICAL INDUSTRIES

VOL. 25, NO. 2. FEBRUARY 1954

World Petroleum

THE MANAGEMENT PUBLICATION OF THE INTERNATIONAL PETROLEUM INDUSTRY

FOUNDED BY RUSSELL PALMER

MONA PALMER
Publisher

E. W. MAYO
Editor

J. C. CHATFIELD
Managing Editor

E. W. MAYO, JR.
Sales Manager

W. E. ANDERSON
Production Manager

J. R. TISSAVARY
Art Director

NBP CCA

Member Of National Business Publications, Inc., and Controlled Circulation Audit, Inc.

SUBSCRIPTIONS

Annual subscription $5.00 (U.S.) postpaid
Single copies $1.00

GENERAL OFFICES

604 Fifth Avenue, New York 20
(Tel. JUdson 6-4820)

BRANCH OFFICES

LONDON, ENGLAND

G. L. Fetherstonhaugh, St. Paul's Corner, Ludgate Hill, London E.C. 4
(Tel. CITY 5318)

HANNOVER-S, GERMANY

Kurt Buge
Annenstrasse 11
(Tel. 8-4179)

LOS ANGELES 14

412 West 6th Street
(Tel. Mutual 1391)

NEW YORK 20

Sales Representatives:
E. L. Townsend, R. K. McQuiston
604 Fifth Avenue
(Tel. JUdson 6-4820)

TULSA 3

O. F. Cozier, Mid-Continent Advertising Manager, 515 McBirney Bldg.
(Tel. 4-5555)

World Petroleum is published by Mona Palmer, Trustee under the will of Russell Palmer.

CONTENTS

9 Washington Pipe Line, by Joseph B. Huttlinger

31 How Much Recession for Petroleum?

32 Doodlebuggers Afloat, by William H. Newton

36 Administration's Program Stands at the Crossroads, by Joseph B. Huttlinger

37 Trans-Canada Gas Line Assured, by J. L. Irwin

38 Ain Zalah Swells Iraq Production, by E. Lawson Lomax

42 The Place of Stripper Wells in the National Economy, by J. P. Coleman

44 Bolivia Hopes for Increased Oil Production, by Dr. J. E. Rassmuss

46 Oil from Neutral Zone Enters International Trade

48 Russian Oil Invades Western Markets

49 Soviet Oil Serves Russian Needs, by Ruth Sheldon Knowles

50 Lube Oil Plant of Cardon Refinery

55 Shell Fits Floating Base for Oil Search

56 Developments in Petrochemicals as Expressed in Recent U. S. Patents, by Heinz Heinemann and Felix Heinemann

68 Oil Company Staff Changes

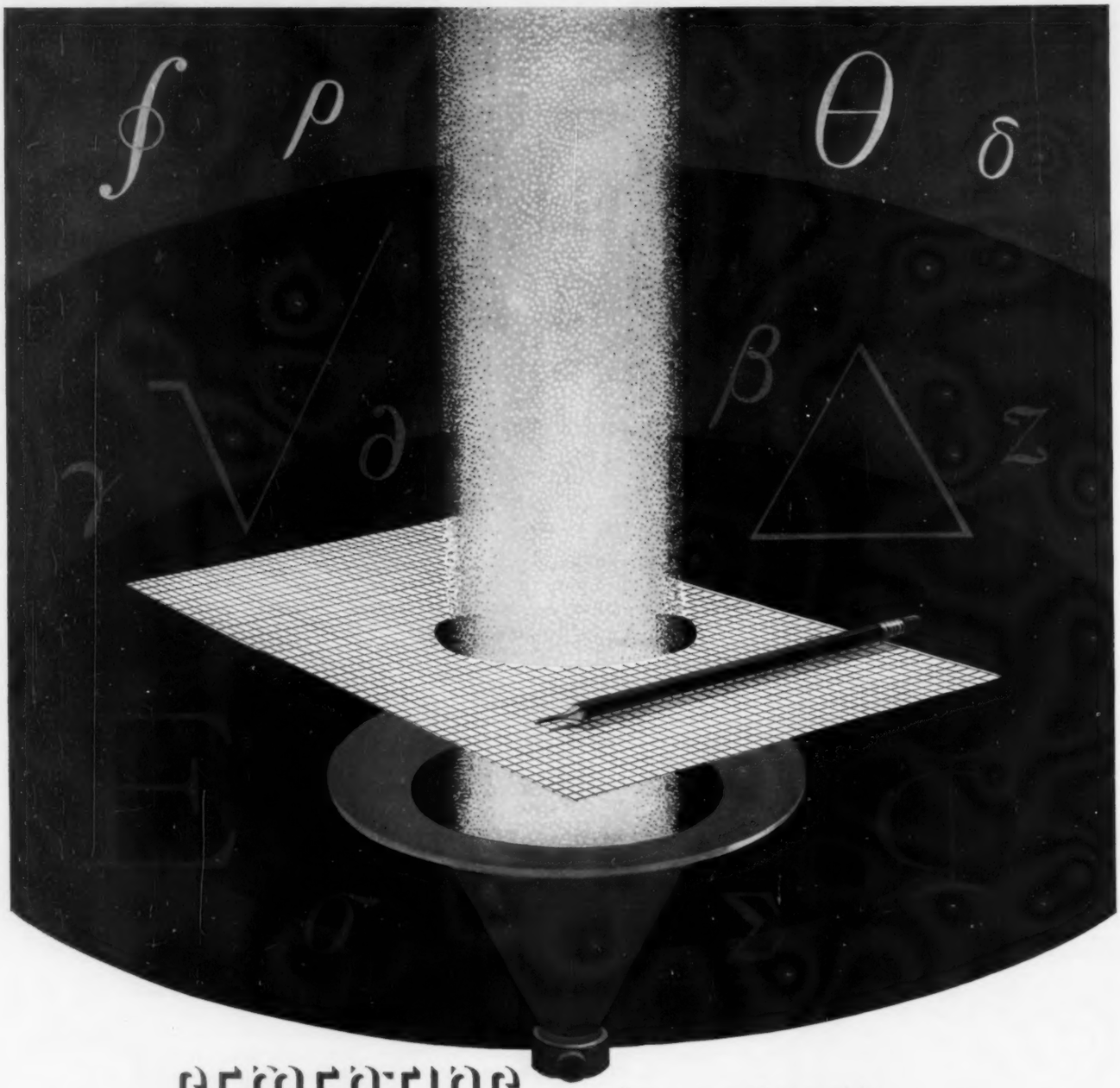
74 British Oil News, by E. Lawson Lomax

80 International News & Notes

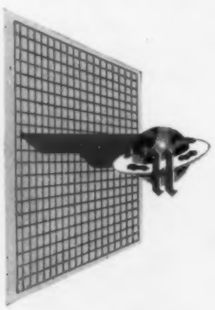
92 Advertisers' Index

THIS MONTH'S COVER

Interior of Cities Service Gas Co.'s 25,000 hp pumping station at Hugoton, Kansas. In this station 330 million cubic feet of gas per day is compressed in Cooper-Bessemer compressors to 900 psi for transportation to Kansas City in the Cities Service 400-mile, 26-inch line.
Color plates are reproduced here through the courtesy of William H. Walsh, managing editor of *Service*, house magazine of the Cities Service Company.



CEMENTING ... has no formula



A million jobs ago we learned no two wells were alike. And a quarter century of research finds no formula for cementing. Well completions side by side still have separate problems. The solution requires most careful analysis—of bore hole, drilling fluids, well conditions, formations, temperatures, depths, and differences in drilling practices. Then highly specialized tools, materials, and techniques are selected for each job. Such analysis has made cementing more and more successful. Operators regard it as a critical point in the history of a well. And geologists realize cementing is an important production tool. This has been established by the world's most experienced cementers, who find that cementing has no formula.

HALLIBURTON OIL WELL CEMENTING COMPANY

"THERE'S NO SUBSTITUTE FOR EXPERIENCE IN OIL WELL CEMENTING"

DUNCAN, OKLAHOMA

HOW MUCH RECESSION FOR PETROLEUM?

IN ALL THE DISCUSSION about a probable business recession in the United States during 1954 and its effect upon the oil industry, nobody has ventured to forecast an actual decrease in the production and use of petroleum as compared with the record volume of the past year. While the estimates of the industry's statisticians reflect a degree of caution, induced probably by persistent forecasts of a general letdown, they agree in predicting an increase in United States demand somewhat less than that of 1953 and less than the annual average of the past decade.

A downturn in the total volume of national requirements would be surprising and certainly is not indicated by reports from the different branches of the industry itself which point to the drilling of a total of wildcat and development wells close to and possibly exceeding the record of 1953 and to a continuation of the steady expansion in transportation and refining facilities.

The period since the close of World War II in 1945 has constituted a new era of rapid growth in the consumption of petroleum products that is not confined to any one region or group of countries. In that space of time, total annual demand in the United States has risen by a thousand million barrels or roundly 60 percent. Impressive as this showing is, the rate of growth, not the actual volume, has been greater in other parts of the world than in the American sector. In 1945 the United States was producing 65 percent of the world's supply of oil. Since that time, due to the astonishing expansion elsewhere, the share of the United States in the total has dropped to less than half, or 49 percent.

A main factor in the sustained rise in the consumption of petroleum in the United States is the constant growth of population which adds upward of two million annually to the number of people in the country. From 1940 to date the increase has been 29 million. The growth in population alone therefore should provide a normal annual increase in demand of roundly three million barrels. As new uses for petroleum are constantly being found and as statistics of consuming facilities, such as the number of motor vehicles and oil heating installations, show that these are increasing more rapidly than population, the actual growth in demand under average conditions is even greater. Thus, in 1945 the per capita consumption of motor fuel was 206 gallons while five years later it had risen to 278 gallons, a gain of 35 percent. Figures for 1953, when they become available, will reveal continuation of a like rate of gain as average consumption in terms of crude, which was 12.5 barrels in 1945 and over 14 in 1950, appears now to have passed 17 barrels per annum.

A mild recession, such as most economists seem now agreed upon as being in store for the United States during 1954, when translated into practical terms, may mean smaller additions to the national fleet of motor vehicles and some relaxation in the torrid pace of industrial activity over the past three years, expressed possibly in the cutting down of overtime and extra shifts and a slackening in demand for certain products. Such a development might be reflected in a reduced rate of gain in demand for oil and gas in certain areas of industry, but the main stream of the nation's activity will continue to flow in substantial volume. If the gain in volume of petroleum demand should be no more than three and a half or four percent instead of six, there is nothing really frightening in the outlook because the readjustment, in the light of past experience, is not likely to be prolonged or to break the uptrend inherent in the resources and enterprise of the country.

Nevertheless, the petroleum industry faces some practical problems that require attention and the exercise of sound judgment. One of these has been created by the confusion existing in the natural gas industry as a result of conflicting views as to the authority of the Federal Power Commission to fix the price of gas sold by producers within a state to pipe line companies engaged in interstate operations. Since gas is produced in many cases in conjunction with crude oil and gas cannot be flared as formerly, anything that interferes with free competition in its sale is a serious blow to the extension of both oil and gas exploration and development.

Continued rise in stocks of crude oil and products is a problem of another sort which has aroused much discussion, but this fortunately is a matter that is within the power of the industry itself to remedy. A collateral issue is that of oil imports, which likewise can best be dealt with through voluntary action.

Doodlebuggers afloat

Top left: Charge is detonated 300 feet to one side of the center of the recording cable. A 2,700-foot detector "spread" secures 1,350 feet of effective subsurface coverage from each shot fired. Center: Maximum charge permitted in Texas tidelands areas is 40 pounds. Relatively insensitive Vibronite or Nitramon is used for the charge, set off by an electric blasting cap and booster. Bottom: After the charge is detonated, the recording boat moves out, and the next charge is fired "on location" within three minutes.

By William H. Newton*

NOTHING COULD BE MORE typical of the 20th century than progress—greater quantity, improved quality, new horizons. By this standard the reflection seismograph phase of the geophysical industry is thoroughly representative of the times. Barely out of cradle, this strapping child of the petroleum industry is rendering increasingly valuable service to the world's unending search for more and more oil.

Latest significant development in the life of Kid Doodlebug is the wholesale invasion of marine areas by seismograph parties. Landlubbers have become sailors, truck drivers have turned into deck hands, and drillers and surveyors have been replaced by teams of electronic navigation specialists.

Significantly, this transformation has taken place with typical doodlebugging efficiency and with a surprising lack of trial-and-error experimentation. As they did in the past, the men who operate and manage the geophysical parties have been able to adapt past experience and native ingenuity to the needs of this new medium. Smoothly, without major hitches, land crews have been converted to off-shore units, and the search for drillable prospects has gone on at a greatly accelerated rate.

Strictly speaking, offshore geophysical exploration is not a brand new enterprise. Doodlebuggers have been at it for years. Yet, until the federal government of the United States recently relinquished its claim to near-shore tidelands in favor of state ownership, there was never a great amount of offshore exploration in progress.

Once the question of tidelands ownership was settled, however, the rush was on. A new oil province had been opened.

**General Geophysical Co.*

and the oil companies had to know where to drill. Nowhere was the upsurge in geophysical prospecting more spectacular than in the tidelands areas of the Gulf of Mexico. Overnight the Gulf broke out in a rash of boats, and the demand for crews mounted. By the end of 1953, 12 seismograph parties were at work off the coast of Texas, with 13 more parties operating off the coast of Louisiana.

The case of General Geophysical Company seems typical of those contract seismograph firms which dived into deep water and succeeded in swimming with remarkable agility. The company's history, during pre-offshore days, included many crew-years of work providing personnel with experience that made possible a successful debut in the Gulf of Mexico.

This company's men first got marsh water in their shoes during the latter part of 1940. This was a short exploration assignment in the South Louisiana marshes, and no further marsh work was undertaken until early in 1946, when a fully-equipped crew began an extensive shooting program near Delacroix Island, Louisiana, in "tough" marsh. Since 1946 the company has been continuously engaged in marsh, swamp, and inland water work, with as many as six seismograph parties assigned to this type of operation at one time.

Necessity proved indeed to be the mother of invention in this case. Lightweight portable equipment was designed and manufactured for these "non-land" parties. Recording instruments were made completely watertight and buoyant, with built-in dehumidifiers. A unit-replacement system for amplifiers became standard and eliminated many trouble-shooting trips for laboratory personnel. Techniques ideal for operations employing helicopters, boats, barges, and marsh buggies were developed. These new ideas, techniques, and items of equipment taxed the ingenuity of all concerned, but management insisted on the best possible tools for the job at hand.

Probably the most important lesson learned by the company, like most seismograph contractors, is the knowledge that no tool should be discarded merely because it appears too old-fashioned or too novel. For example, the pirogue and skiff are standard equipment for marsh and inland-water crews, but the field supervisor may visit the units in his own floatplane. With many a mile of marsh and water between the office and his crews, Supervisor J. P. Daniel of General Geophysical flies his plane more than 500 hours per year on inspection trips, yet he would never condemn a pirogue or even a man's two feet as a means of covering territory and getting a prospect shot.

Previous "non-land" experience proved invaluable when crews had an opportunity to put an offshore seismograph party to work in Gulf waters. No special recording instruments had to be designed and manufactured. Field men accustomed to the feel of a pitching deck were on the payroll. Vibronite[1] and Nitramon[2] were not novelties. The intricacies of food, materials and explosives supply were no mystery.

The major problems to be solved included boats (what type shall we use, and where do we get them?), surveying (which of the various electronic systems best suits our needs?), and a recording cable complete with detectors (drag or float, pressure or displacement?). After careful study of all factors involved, steel-hulled recording and shooting boats, 110- and 87-footers respectively, were chartered, complete with crews; a 104-foot wooden-hulled crash boat conversion was hired for a supply vessel. An electronic survey firm was engaged. A drag cable with removable gimbal-mounted displacement-type detectors was selected.

The boats arrived in Galveston, Texas, first operating base, on September 5, 1953. In spite of warnings from the boat crews, who were old-timers at this offshore stuff, that rigging-up would take at least five days, General's technicians, machinists, mechanics, and welders had the boats ready to leave the dock at daybreak on September 7. At 9:30 AM the first shot was detonated offshore and the offshore exploration program was underway.

It took approximately five days of shakedown time for this new seismograph party to work all the "bugs" out of its operation. The short duration of this period is a tribute to the planning of basic procedures that preceded the actual operation. Once the job was started, all that remained to be done was to refine basic plans and to permit personnel to develop skill and dexterity through practice.

How does an offshore crew operate? Well, this particular unit is engaged in a continuous operation, with an oversize personnel complement. The men work ten days, then have five days off, with 50 percent of the crew "changing" every five days. This permits the boats to stay offshore, on the job, in all but the worst kind of weather, ready to work whenever daylight and weather permit. The

[1] *"Vibronite-B,"* registered trade mark, Hercules Powder Company.
[2] *"Nitramon WW,"* registered trade mark, E. I. du Pont de Nemours & Company.

boats return to the land base every fifth night for the crew change, refueling, loading explosives, and any maintenance that cannot be performed offshore.

The five-day work period starts before dawn, when the recording and shooting boats leave the harbor. They are at a check point by the time the electronic navigation system's shore stations go on the air, then proceed to the section assigned for shooting.

Approaching the line of shot points, the cable is carefully paid off its reel on the stern of the recording boat and dragged behind the boat, while the observer checks his instruments. Meanwhile, shooting boat personnel are busy transferring "powder" (Nitramon or Vibronite) from hold to deck. Caps and boosters are shifted from main magazines to smaller working magazines. Radio communication with the recording boat is tested. The blaster, safety interrupter switch, and firing line are tested. Floats, consisting of empty cardboard powder boxes or brightly colored balloons, are prepared for the charges.

The electronic technician, aboard the recording boat, is directing the skipper, "herding" him to the precise location of the first shot. Once the boat is on location, propellers are stopped, backed down to halt the boat, stopped again. The shooting boat, astern and to one side, surges ahead at the radio signal "move in." Opposite the center of the cable and 300 feet from it, the charge goes over the side as the float marking the center surfaces.

The only break in the normal day's operation comes when the supply boat eases alongside the recording vessel to put aboard the many necessities for life afloat.

The field supervisor visits one of his inland water crews by air. The floatplane approaching the recording boat flies more than 500 hours per year and results in major savings of valuable time.

Diesels at full throttle, the shooting boat pulls rapidly away from the charge, which hangs five feet below its float, as the shooter signals "charge over." Carefully judging distance, the loader closes the safety interrupter switch, and the shooter signals "all set." A twist of the blaster handle sends a roaring column of white water skyward. Another seismic impulse has been generated.

With the "all set," the shooting boat skipper has reduced power. He maneuvers his boat to hold station on the recording boat, which begins moving to the next location as soon as the observer has recorded the results of the shot. Within three minutes the second charge is detonated and the two boats continue down the line.

Teamwork is the key to the speed at which this operation proceeds. The four members of the shooting crew function as a unit; the shooter handles the communications and actual firing besides being in charge of the entire shooting operation. The loader primes the charges, attaches floats, throws the charges overboard and handles the safety switch. One helper tends the firing line and another helper prepares floats and charges of proper sizes and relieves his co-workers periodically. Every man is trained to handle at least two jobs.

Aboard the recording boat, teamwork is equally important. The observer is in charge of the operation and is aided by two assistants. Each of these three men is qualified to operate the recording instruments and develop records, tasks normally requiring two men. The extra man relieves the others in addition to relieving the fourth member of the recording crew, a helper whose primary duty is tending the cable.

General's cable is a tremendous thing

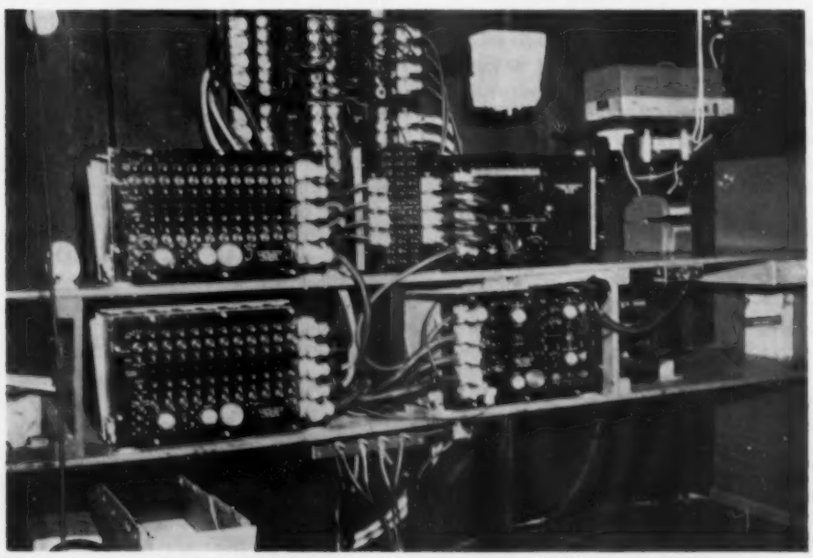
encased in a tough waterproof cover, with 18 pairs of conductors, each leading from the boat to a different set of detectors. The detector groups are spaced 150 feet apart in the cable, with a 300-foot gap at the center, making a total "spread" length of 2,700 feet. An additional 750-foot length of cable connects the principal cable to the boat. Shot locations are 1,500 feet apart, so that effective subsurface coverage is continuous.

Banging out a shot every three minutes permits these seagoing seismographers to cover a surprising area in a day. Sixty-five miles of coverage is not an unusual day's work, and the best month of operation by this crew produced an average of 40 miles shot per day, including those days when weather did not permit any work at all. This production figure becomes particularly impressive when compared with the totals amassed by land crews: 50 miles of continuous coverage per *month* is a very respectable total for a dry-land seismic party under excellent conditions of weather and topography.

Surveying, shooting, and recording are not the only activities involved in "shooting" 40 miles per day. Gathering and distributing the supplies for this operation constitute major chores. A typical load for the supply boat on its daily run may include photographic paper for the recording camera, rubber balloons for charge floats, parts for on-the-spot engine maintenance, new charts for the boat skippers, ice cream and T-bone steaks for the galleys, mail for the crew members. Food quality is particularly important: despite air-conditioned quarters and innerspring mattresses, crew morale and over-all efficiency cannot stay high without top-flight chow. Not the least important of the supply boat functions is the daily check on positioning made by the electronics crews this boat carries.

A five-day work period generally starts with a pre-dawn departure from the dock. The boats are at a check point by the time Lorac goes on the air and thus can take maximum advantage of all weather calm enough to permit work.

Mechanical, photographic, electrical, and electronic processes are involved in the functioning of this set of recording equipment located in an air-conditioned dark-room called the "dog house."



Even when the records have been developed and dried, work is not finished. By themselves, the records and location maps have little value. A team of interpreters must take over and translate wiggles on records into depth points on maps and cross-sections. Located in an office on land, nine men and five young women have this job, under the supervision of an experienced party chief. Faced with a tremendous volume of work, their tasks broken down into specialized steps, these computers and interpreters work fast and accurately, putting in long, hard hours on the job. In turn, the oil company for whom the exploration is conducted maintains a staff of seismologists whose duty is to check, recheck, then recheck again. Results must be reliable.

The particular offshore crew referred to herein, though operated by just one contract firm, is representative of the many units that are combing the offshore areas of the world in search of places to drill for oil. Operating procedures vary from crew to crew and from company to company. Equipment, from detectors to cables, from boats to food, varies too. Yet these doodlebuggers, afloat as on land, are getting the job done, and getting it done in the fastest, most economical way possible. There's no better way to clear a new frontier for progress.

WASHINGTON DATELINE

Administration's program stands at the crossroads

By Joseph B. Huttlinger

As CONGRESS settles down to work on the heavy program of legislation confronting it, discussion in Washington naturally has been concentrated particularly on the subjects dealt with in the President's State of the Union message. Since this was a broad outline of policies underlying the Eisenhower program with seven separate messages to follow dealing with specific topics, the real test of the administration's plans will come as these individual messages are presented and Congressional committees get down to work on definite legislative proposals.

While there has been plenty of criticism of some of the ideas advanced by the President in his first address, part of it (as expected) of a purely partisan nature and part based on honest objections to some of the recommendations put forward, the general reaction, both in the capital and from the country at large, may be said to be favorable—certainly so as measured by messages received at the White House. The volume of approval is most uniform in regard to the passages dealing with foreign affairs. Bipartisan support for the Eisenhower position on international relations seems to be assured, with Democratic members of Congress taking the position that what is proposed is essentially a continuation of policies initiated by preceding Democratic administrations and with Republicans approving the new approach.

On domestic matters there is no such approach to unanimity. Sharp divisions exist both in Republican and Democratic ranks. The President's middle-of-the-road policies bear too much resemblance to some New Deal measures for old guard Republicans, while members of the opposition find fault with them as being expressions of stand-pat conservatism. The fate of administration plans for internal measures will depend largely upon the shape they assume after discussion, debate and possibly public hearings by Congress.

In the international field the administration warns the forces of communism of sharp retaliation in the event they start new aggression, and proposes a program of continued cooperation and "friendship" with friendly nations over the world.

Area by area, the President offers Korea a mutual security pact; Indo-China "material assistance" in its fight against Communists; South Asia, "the support of the United States"; Middle East, "sympathetic and impartial friendship"; Europe, the North Atlantic Treaty Organization; and the Western Hemisphere, "solid friendship."

In the field of national defense, scheduled to absorb more than half the coming year's budget, the President proposed a powerful and mobile military force with emphasis upon naval and air forces as against ground troops. He would oppose a pay raise for the military forces, although more fringe benefits were recommended. He would emphasize continental and civil defense. And he urged the country to take part in the St. Lawrence Seaway as a defense measure. Most controversial, he would share atomic knowledge with friendly allies, an action which needs the consent of Congress.

On the home front, the President suggested government spending of $67 billion in the coming fiscal year, against $72 billion in the current year. He would allow a 10 percent reduction in individual income taxes and the ending of the excess profits tax on business, both of which went into effect in January of this year. He proposed a series of income tax revisions designed to aid widows with dependent children, working wives and families with large medical bills. The President also would lower taxes on business that goes in for research, expansion, and overseas development. On the other hand, because of the need for revenue, he opposes sweeping cuts in excise taxes, including that on gasoline which was scheduled to go down from two to 1.5 cents a gallon on April 1 of this year. The President would hold the corporation tax at 52 percent of net income. By and large his recommendations point toward lower taxation, in contrast to ever rising expenditures under preceding administrations.

The administration seeks a revision of tax laws to smooth out inequities and favors gradual elimination of double taxation as exemplified in the levy on income from dividends after the same earnings have been subjected to taxation as corporate income. It wants "maximum progress" in building federal highways, the addition of 10 million more persons to the social security system, and more government aid for housing, medical research, hospital construction and health insurance. The health and social security proposals are slightly reminiscent of New Deal days, but go far less than President Truman's demand for a system of government-managed health insurance.

General Eisenhower diagnoses the economic health of the nation as excellent, but he promises to meet any evidence of serious weakening with measures to stimulate activity and halt the spread of unemployment. He would like to have the national debt limit raised to meet a possible gap between income and outgo, but Congress will be loath to agree to this unless an emergency is actually on the doorstep.

In the field of labor relations, the President proposed 15 changes in the Taft-Hartley Law, few of them drastic. Highlight was a proposal for a secret vote among union members in the case of strikes. This is likely to be hotly debated with final action uncertain. Other proposals, dealing with the injunction, secondary boycott, union welfare funds, and the like, represented minor rather than major changes in the present act, and were well balanced to benefit unions in some respects and management in other cases.

A further scaling down of the government's activity in the field of synthetic petroleum from coal, shale and natural gas was unfolded. The administration is ready to let the Synthetic Liquid Fuels Act expire in 1955 after 11 years al-

though the government plans to continue research and pilot plant operation against the time when the processes could be turned over to private industry. In the past, President Truman had urged the government to go ahead with commercial-scale synthetic fuel plants. At one time, Interior Secretary Oscar L. Chapman asked for half a billion in government funds for this.

The fate of the program at the hands of Congress is yet to be seen, but much of it seems certain to be enacted into law. Some parts will be changed, some ignored, and new proposals will come from the law makers. In Congress, sentiment so far expressed is for going along with the President on recommended tax reductions and then adding more cuts. Thus, the gasoline excise of two cents may yet be scaled down, corporate income taxes may level off at 50 percent instead of 52 percent, and tax aids for foreign corporations may be greater than the administration asks. The Congressional economy drive on the other hand may pare down funds asked for foreign military aid, for national defense and other programs.

To the world at large, perhaps two points of the Eisenhower State of the Union message are of particular importance. One of these reports "a great strategic change" in the world during the past year so that "the initiative is ours." We will use it, says the President, to protect the freedom of our people, to maintain a strong, growing economy, and to concern ourselves with the human problems of the individual citizen.

The second point is that we are in a "transition" from a wartime to peacetime economy. The United States, said the President, can complete the transition without "serious interruption" to its growth. At the same time, the government is ready to aid business, if needed, by use of credit policies, of public works, taxation, social security and other programs.

If the President means what these statements seem to mean, then the whole free world is now in a new era, where peace is probable, defense spending is due to drop, and the ways of peace and ease are gradually to reappear. This is a prospect of fundamental importance.

Trans-Canada gas line assured

By J. L. Irwin

ANNOUNCEMENT of the merger of Trans Canada and Western pipe line companies made public by Trade Minister Howe on January 8 is one of the most important steps taken in the development of Canada's gas industry, assuring the Dominion of early construction of the world's longest pipe line and providing an outlet for its huge western gas reserves. Events moved rapidly after the Alberta government announced in December that it had a gas surplus of 3½ trillion cubic feet available for shipment to the east, coupling this with the suggestion that the Western and Trans Canada companies join forces in carrying out the project. Officials of the two companies, with representatives of investment bankers, were called into conference with government officials and the merger agreement was quickly reached.

While the two former companies are partners on a 50-50 basis, Trans Canada Pipe Lines Ltd., the company originally seeking an all-Canadian franchise from Alberta to Montreal, will give its name to the combination resulting from the merger. The project is to pipe gas from Alberta to Toronto and Montreal with a line running south to the Minneapolis market, subject to a permit being secured from the Federal Power Commission in Washington. This latter route was that originally chosen by Western Pipe Lines. Gas will be made available for both eastern Canada and the mid-western area of the United States, though the former area will have preference. Financing and survey of markets will take some time, but expectation is that construction may be started this coming summer.

From Princess in southern Alberta to Montreal the pipe line will be 2,240 miles long and is estimated to cost $243 million to $318 million, depending on whether 30 or 36-inch pipe is selected for the main trunk which will touch at Regina, Winnipeg, Kenora (Ont.), the Lakehead and Sudbury. From Toronto to Montreal the line probably will be of 24 inches. From Morrisburg, Ont. a branch line will run to Ottawa.

The big market the new company is aiming for at the moment is in Ontario, but as plans indicate, it is intended to extend the system to eastern Canada and it is hoped also to develop outlets in the mid-western United States and in the area around Buffalo, subject to approval by the U.S. Federal Power Commission.

A report made in December 1953 by the conservation board of Alberta and concurred in by the provincial government really gave the green light to the ambitious pipe line proposal.

"The government's major concern," the report declared, "is to facilitate the speedy completion of this important matter in that it is important to the continued development of the gas and oil resources of western Canada that an adequate market for gas, surplus to local requirements, be established at the earliest possible date.

"The government believes that this can best be accomplished, and the interests of producers, consumers and Canada as a nation best served, by Trans Canada Pipe Lines *et al* and Western Pipe Lines combining into one project the major proposals of their respective applications; that is to say, the construction at the earliest possible date of an all-Canadian pipe line from southern Alberta through Regina and Winnipeg to the markets of Ontario and Quebec with a connecting line running south from Winnipeg to the Minneapolis market area of the United States.

"Such a project, properly designed, would meet the requirements of a national program for the large scale development and utilization of Canadian resources by and for the people of Canada, and at the same time establish a valuable expandable export market which would substantially improve the economics of the overall project, permitting higher prices to western producers and lower prices to eastern consumers."

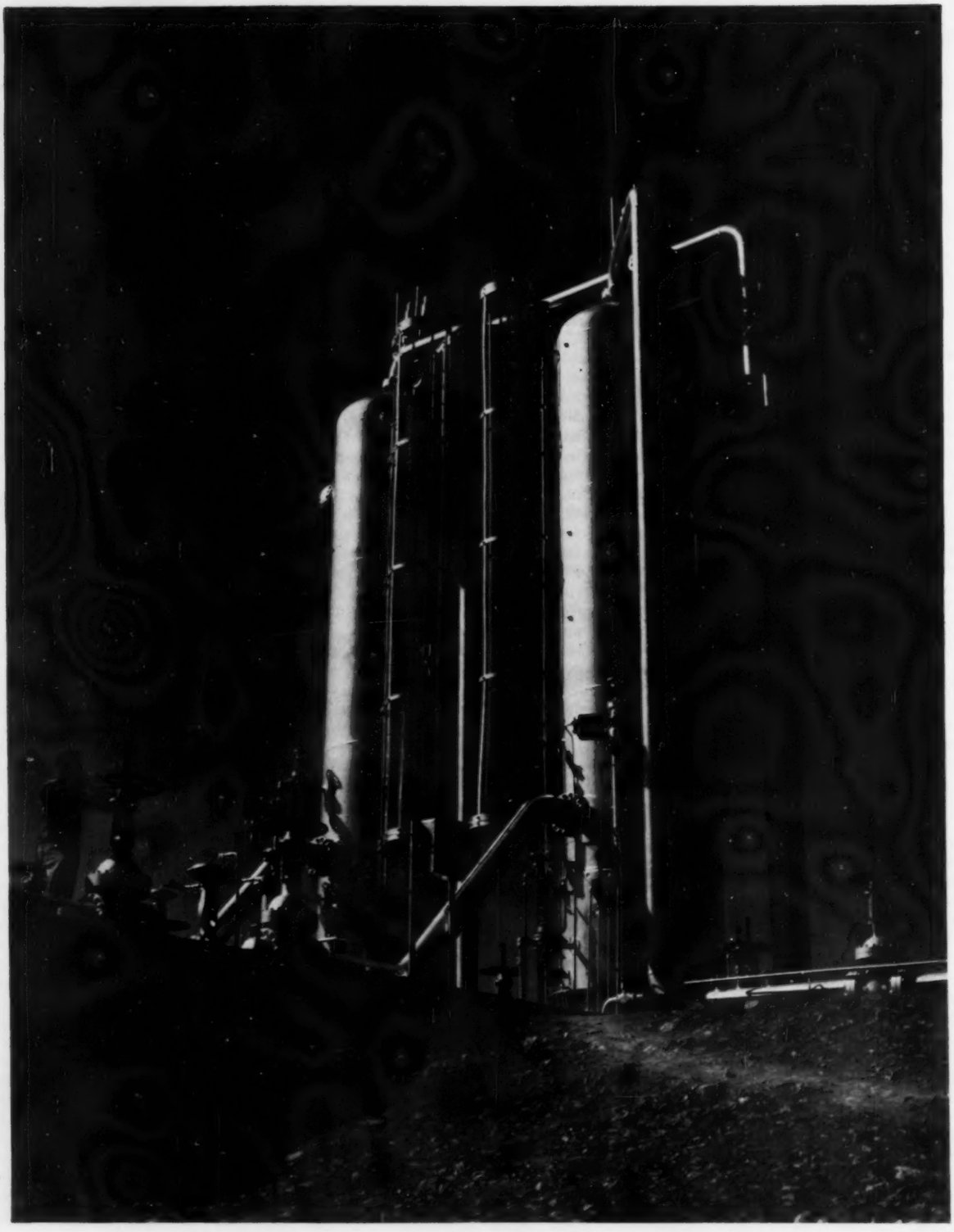
Over a period of years an average load for the line is expected to be about 365 million cubic feet of gas daily. The 3.5 trillion cubic feet of reserve, stated by the board to be surplus available for eastern export, would keep the company in supply at this rate for about 22 years. With the annual increase in discovery of new reserves, this period of time will of course be considerably extended.

Tax concessions from the federal government are anticipated. These are expected to include removal of tariffs and sales tax on pipe line materials not made in Canada. There is no prospect, however, of a cash subsidy.

During the period when the Canadian market for gas is being enlarged, government officials in Toronto express confidence that a growing market in United States communities across the border will be able to absorb Alberta gas surplus.

With the completion of export lines to the east and the west, natural gas will have ceased to be a frozen asset in Alberta, and will rank with oil in its importance to Canada's economy.

Vertical separator units at the Ain Zalah degassing station.



Ain Zalah swells Iraq production

By E. Lawson Lomax

THE CONCESSION of the Mosul Petroleum Company in Iraq covers all land lying west of the Tigris and north of Latitude 33 and was first acquired in 1932 by the British Oil Development Co., organized in 1928 with 60 percent British holding and 40 percent Italian holding. In 1930 it became an international company, the capital being 45 percent British, 31 percent Italian, 12 percent German and 12 percent Franco-Swiss. In 1935 the groups associated in the Iraq Petroleum Co. formed Mosul Holding Ltd. for the purpose of acquiring shares in the company and in 1941 BOD assigned its concession to the Mosul Petroleum Co., Ltd.

The early petroleum history of this section of Iraq goes back to shortly after the conclusion of World War I when the present Kingdom of Iraq was formed, regaining the status it had lost in 1258 as a result of Mongol invasions.

Prior to the outbreak of that war, negotiations for concessions had been carried on with the Ottoman Empire government of Abdul Hamid. With his fall these negotiations were interrupted, but were later resumed with the succeeding Turkish government. Real exploration, however, did not commence prior to the outbreak of war.

The partitioning of Mesopotamia at the conclusion of World War I with the final defeat of Germany led to highly contentious questions. As a highway to the East before the construction of the Suez Canal, Mesopotamia had always figured largely in history as a battleground of eastern and western contending powers. The Tigris and Euphrates valleys and deltas with their fertile water lands have always been a famous and prolific granary.

A new importance was given to the region with the birth of the oil age, for the many known seepages of oil and issues of gas in the plains and foothills encouraged the belief that valuable oilfields existed. The proved existence of such oilfields in Persia served to accentuate interest in Mesopotamian prospects.

Promises of an indefinite kind given by Britain to the Arabs in exchange for their help in ejecting the Turks from Arabia could only be partially consummated due to the opposition of France, and internecine conflicts between racial factions somewhat upset the carefully considered plans of Britain for the formation of an Arab state. With the occupation of Damascus by France and the expulsion of King Hussein from the Hejaz by Ibn Saud, it devolved on the great powers to fix the delineation of newly-formed Iraq with regard to the bordering states of Turkey, Palestine, Saudi Arabia and those Shaikdoms and Sultanates under British protection in the Persian Gulf. The boundaries of Iraq undoubtedly caused most concern due to the potential oil reserves in the Vilayet of Mosul and elsewhere. Turkey stubbornly opposed a frontier that excluded Mosul, and the French raised difficulties in fixing the Syrian frontier near Jebel Sinjar, due to a belief that this great limestone anticlinal massif contained oil. Once boundaries were agreed upon and the susceptibilities of neighboring states had been mollified by concessions of one kind or another, questions arose as to the validity of somewhat nebulous agreements or promises made to the nationals of sundry countries by the Sultan of Turkey or his entourage.

After many acrimonious exchanges of views on this subject, a settlement was finally reached by which British, Dutch, French and American oil interests acquired shares in the production of the oilfields. The concessions granted to the Turkish Petroleum Co. in March 1925 authorized the company to select within a stipulated period 24 plots each of an area of eight square miles and required development work to be carried on until production justified the construction of a pipe line to the Mediterranean seaboard for export of oil. After the company had selected its plots, the government intended to offer other plots at auction. On expiry of the period prescribed for the selection of approved acreage from the blanket concession, no oil in economic quantities had been struck to guide a choice. With other applicants clamoring for concessions, the Iraq government was eventually constrained to settle a disquieting situation by granting to the initial group all land east of the Tigris, and to a new group, in which Italy and Germany were included with Britain and France, about 50,000 square miles of land west of the Tigris. Although not regarded as an equitable distribution by the contestants, it removed an irritating controversy and salved passions.

Previous to the serious work undertaken by the Iraq Petroleum Co. group, some oil had been worked in a primitive way by the inhabitants at several points, namely Nimrud, Zakko and Qaiyarah. Before the expulsion of the Turks the Germans had developed a minor oil industry at the latter point, but had failed to tap large production. At Naft Khaneh near Khanikin in the so-called Transferred Territory, oil had also been found by the Persian Oil Co. in 1927 and by the Iraq Oil Co. on the same structure that extended across both countries.

Shortly after the division of land for prospecting, the whole situation was suddenly changed by the striking of a prolific gusher of light oil on October 13, 1927 on the Kirkuk structure at Baba Gurgur near the town of Kirkuk, alongside a seepage which had been known for thousands of years. Only a short time afterwards, the Iraq Petroleum group struck a powerful gusher of heavy oil at Qaiyarah. Both of these important discoveries quickly led to the completion of other wells which demonstrated the extent and importance of several folds, all clearly reflected by topographical relief.

Until 1940, all oils found on proved structures west of the Tigris yielded heavy oil from fissured zones in the Asmari limestone, but drilling to greater depths on a well-defined anticline at Ain Zalah near the Turkish frontier led to the discovery of light oil in economic quantities and opened a new vista of Cretaceous light oil fields. Blends of light and heavy oil produce a mixture pumpable in long pipe lines without treatment, but the manufacture of road oil or asphalt, or the hydrogenation of heavy oils may actually give the heavy oils a commercial value. Natural gas may prove a valuable product for the extraction of

heavy ends and the sulfur content which is often high.

Proved reserves in the Kirkuk field fully justified the laying of pipe lines to the Mediterranean and those now in use provide for the conveyance of 440,000 to 450,000 barrels daily to the Mediterranean seaboard.

The first well of the Mosul Petroleum Co.'s concession was brought in in the Qaiyarah area on October 13, 1925 and flowed 4,000 barrels per day at a depth of 780 feet, two days before the Iraq Petroleum Co.'s Baba Gurgur well No. 1 came in as a gusher with an estimated initial production of about 80,000 barrels per day, but while the oil produced by Baba Gurgur was light and only mildly sulfurous, that at Qaiyarah was very heavy, about 11° Beaume, was highly sulfurous, and had a solid bitumen content of about 55 percent.

Such an oil has very limited commercial value at present, and although a certain amount of it is being used in Iraq for road-making purposes, this is naturally limited.

Light oil was struck at Ain Zalah, about 40 miles northwest of Mosul, in 1940, at a depth of 5,100 feet.

The reservoir rock is limestone of Maestrichtean age, overlain by a thick series of shales, the succession being as shown in Table I.

This structure is an east-west anticline eight miles long and two miles wide with a closure of 1,000 feet.

By the spring of 1941, four more wells had been drilled to 5,100 to 6,000 feet, but for defense measures were all plugged and operations were closed down. Work was not resumed until 1947.

Up to that time a total of 93 wells had been drilled at Qaiyarah, Khanugah, Mishraq, Najmah, Jawan, Hibbarah, Sadid, Qasab, Adaiyah, Alan, Gusair, Maklinl, Awasil, Butmah, Nafatah, Qalain, Hit, Anah, Abu Jer, Ain al Naft and Ain Zalah, but it was only at the latter place that commercial production was discovered.

Since operations were resumed in October 1947, 14 wells have been drilled in the Ain Zalah field and test wells at Mushorah and Butmah.

A 135-mile, 12-inch pipe line has been built from the field to K.2 station on the main Kirkuk-Mediterranean pipe line. It takes the oil from the storage tanks through the main pumphouse at Ain Zalah.

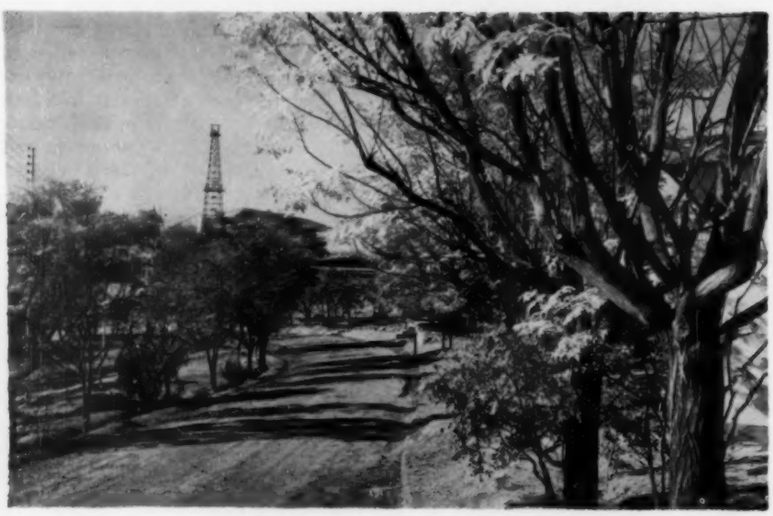
Stringing of this pipe line commenced in April 1952, and was finished on July 29. The field installations were completed in early September and pumping of crude to K.2 began on September 16. Total production of crude during 1952 was 281,977 tons and export deliveries amounted to 223,817 tons.

While the Ain Zalah field is not comparable in size or productivity to the Kirkuk or Zubair fields, yet it cannot be classed as small in a world comparison, seeing that production for the first three-fourths of 1953 amounted to 1,006,961 tons.

The field is situated in the hilly country in the north of Iraq and is less accessible than the other Iraq fields. Most of the indigenous labor has been recruited from the neighboring villages and towns. Having been mainly occupied in agriculture, local labor has had to be trained in the many industrial duties

Panoramic view of the Ain Zalah station, where herdsmen tend their sheep in sight of the installations.

A scenic view at Ain Zalah with a Mosul Petroleum Company rig in the background.



Winnowing goes on as it has for centuries at the village of Kirkuk near Ain Zalah.

which make up the work of a busy oilfield.

The foreign staff consists of about 50 British and American personnel who are engaged in operating the field and in training locally-recruited laborers in their duties.

Many of the local workers prefer to live in their own villages, from which they are transported daily by the company's motor vehicles. Some 350 of the workers from Mosul live in what can be classed as a camp rather than a town and they are transported to their home town at week ends.

In spite of this, the social services are well developed. There is an up-to-date hospital at Ain Zalah which during 1952 treated 594 in-patients over a total number of 2,941 "hospital days," while clinics and dispensaries treated 11,345 outpatients, totalling 23,947 treatments. The company's medical services carried out 1,092 routine medical examinations in 1952 and 1,909 vaccinations and inoculations were performed.

There is a fully-equipped restaurant which serves about 400 meals a day, a cinema giving two to three shows a week, and a lending library stocked with books in Arabic and English, as well as newspapers and magazines in the same languages.

Physical recreation is provided by football fields, tennis courts, volley ball and basket ball and a new club with swimming pool is under construction. In season there is also good hunting and shooting of indigenous game in the surrounding countryside.

The crude oil, prior to being pumped through the 12-inch pipe line to K.2 station on the main Iraq pipe lines, is subjected to the usual de-gasification which is necessary for prevention of corrosion and emanation of noxious fumes on storage. The pumps for delivery through the line are powered by National Superior dual fuel engines.

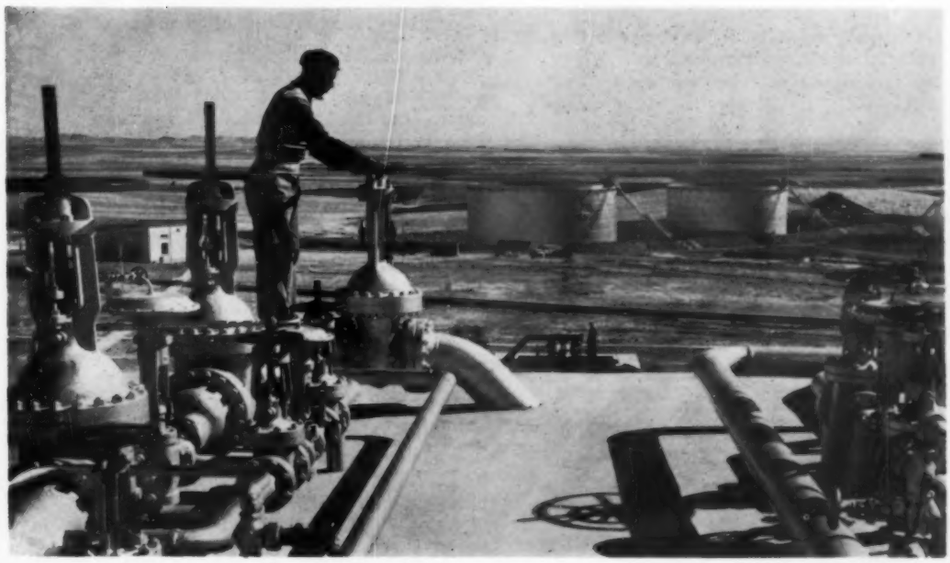
Electric power is generated at the camp by one 150 kw Crossley-British Thomson-Houston diesel alternator set, generating at 440 volts 50 periods, and two 65 kw MAN-Lancashire Dynamo diesel alternator sets generating at the same voltage.

Repair shops for drilling plant and transport vehicles, consisting of machine shop, turning department, blacksmith's shop and foundry, are located at the camp. These shops were originally fitted up on a temporary basis, but are being equipped with new and modern tools.

The writer is indebted to his friend, A. Beeby Thompson, the well-known oil expert, for information regarding the early history of the Iraq fields.

Table I

AGE	LOCAL REPRESENTATIVE	LITHOLOGY	THICKNESS IN FT.
Miocene	Lower Fars	Shales & anhydrite	450+
		Limestone	550
Oligocene to Eocene	Qarah Chauk	Limestones with shales at base	2,300
Paleocene to Danian	Dohuk	Shales with sandstones	1,800
Maestrichtian		Limestone	1,000+



View of manifolds at the degassing station, with storage tanks in background.

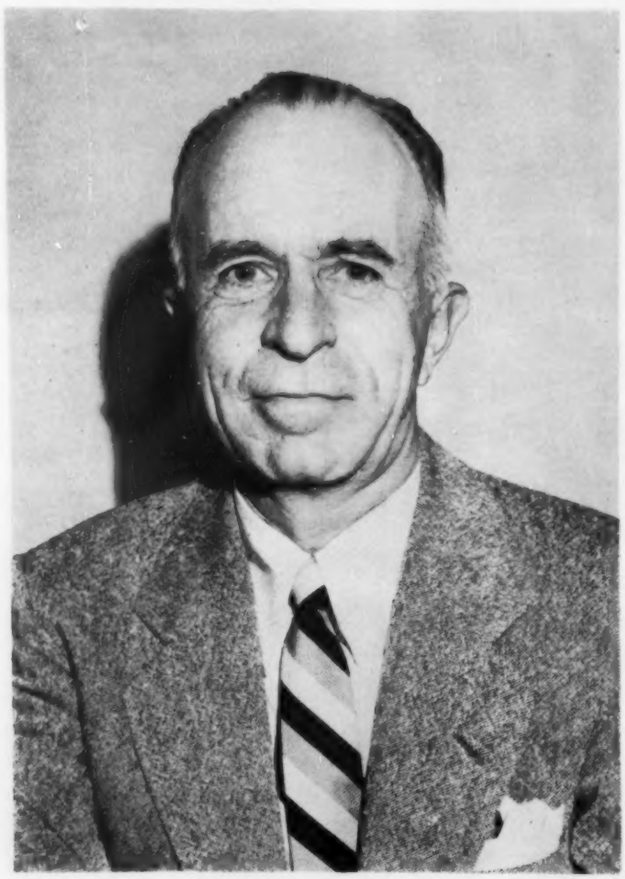
Pipe line workers need protection from the fierce desert sun.

View of the daily rate quarters at Ain Zalah.

A workman receiving medical treatment at the Ain Zalah hospital.

The place of stripper wells in the national economy

By J. P. Coleman*



SEVENTY PERCENT of the producing oil wells in the United States are classified as stripper wells. They are the wells of small production, the wells that are struggling to stay alive. For the purpose of definition and statistics, stripper wells are those producing less than 10 barrels of oil per day. Actually, the average daily production of all wells making less than 10 barrels per day is three barrels. So, 70 percent of the nation's oil wells average three barrels per day and return the producer, at the present price of crude, about $6.90 per day after royalty is paid. Out of this $6.90 must be paid all costs of lifting the oil, plus taxes. This, briefly, is the problem of the stripper well operator.

There were approximately 480,000 oil wells in the United States at the beginning of 1953: of these more than 332,000 were stripper wells. The daily average production of domestic oil wells for 1952 was about 6,500,000 barrels daily, an average of 1,354 b/d for all wells. Deduction of the nearly one million barrels of stripper production leaves for the remaining 148,000 wells an average of around 37 barrels per day. Since there was a shut-in capacity of approximately one million barrels per day in 1952, this means that the 148,000 wells larger than 10 barrels per day could have produced a daily average of about 44 barrels if there had been no imports.

In terms of reserves of producible oil, it has been estimated that the reserves underlying these stripper wells as of January 1, 1953 amounted to over four billion barrels. An additional three billion barrels can be produced from stripper fields provided adequate secondary recovery methods are instituted. The statistics on stripper wells are prepared annually by the staff of the Interstate Oil Compact Commission and this commission has given much thought to the problem. It is recognized by all students of the industry that this 70 percent of the nation's wells is necessary to the country's economy and defense. When the return from a stripper well is less than the cost of operation, the well is usually abandoned. Abandonments amounted to over 13,000 wells in 1952 and this process goes on every year. Once abandoned and with casing pulled, the well and location is lost forever. Only in exceptional cases are leases drilled again to the original producing horizon.

If stripper wells can be kept in production, there are two general gains: first, the current production is made

*President, National Stripper Well Association.

available; secondly, the well may become part of a secondary recovery project and may be made to provide a great deal more oil that otherwise would never be produced by primary means.

By primary methods of production is meant the production of oil by the natural forces at play when the reservoir is originally tapped, such as dissolved gas expansion or natural water drive. All deposits of oil are accumulations in partially saturated porous media such as sandstones or limestones. By secondary recovery is meant the recovery of oil from a reservoir by the introduction of a new source of energy to drain the remaining oil from the reservoir. These new sources of reservoir energy are usually of two kinds: (1) the introduction of gas under pressure into the reservoir; and (2) the introduction of water under pressure into the reservoir.

Secondary recovery is dependent on two things: scientific knowledge and development, and the economic incentive, or in plain terms, the price of oil. Secondary recovery projects are expensive and operators will undertake them only when they believe the returns are worth the gamble. Not all secondary recovery projects are successful from a physical standpoint. The average secondary recovery project calls for the workover and cementing of all casing (not previously cemented) into the reservoir; also the drilling of additional wells to the producing horizon for input wells and the building of expensive water treating and pumping plants. A large investment is called for before any new oil is produced and sometimes months of waiting before results are appreciable.

However, scientific knowledge of the subject is increasing and the problem becomes progressively an economic one. With fair prospects of a reasonable price for crude, more and more operators are turning to secondary recovery methods to restore declining reserves.

The matters of prime concern to the stripper operator are his price and his market. He must sell all of his oil and sell it at a reasonable price. America has been blessed with an abundance of oil because its people have been free and because of this freedom the pioneering spirit has flourished. In America any person with enough money and courage can acquire an oil lease and drill a well in search for oil. If he finds oil he can usually sell part of it. He could not do this in many other countries. This abundance in the past has sometimes become temporary over-abundance and the producer's return has become too low for him to exist. He then drowns in his own oil. This condition caused many periods of oil feast and famine in the past. Recognizing that unrestricted production in times of excess productivity caused a great deal of waste above and below ground, some oil producing states have attempted to conserve oil in the ground by prescribing rules as to rates of oil production and gas wastage.

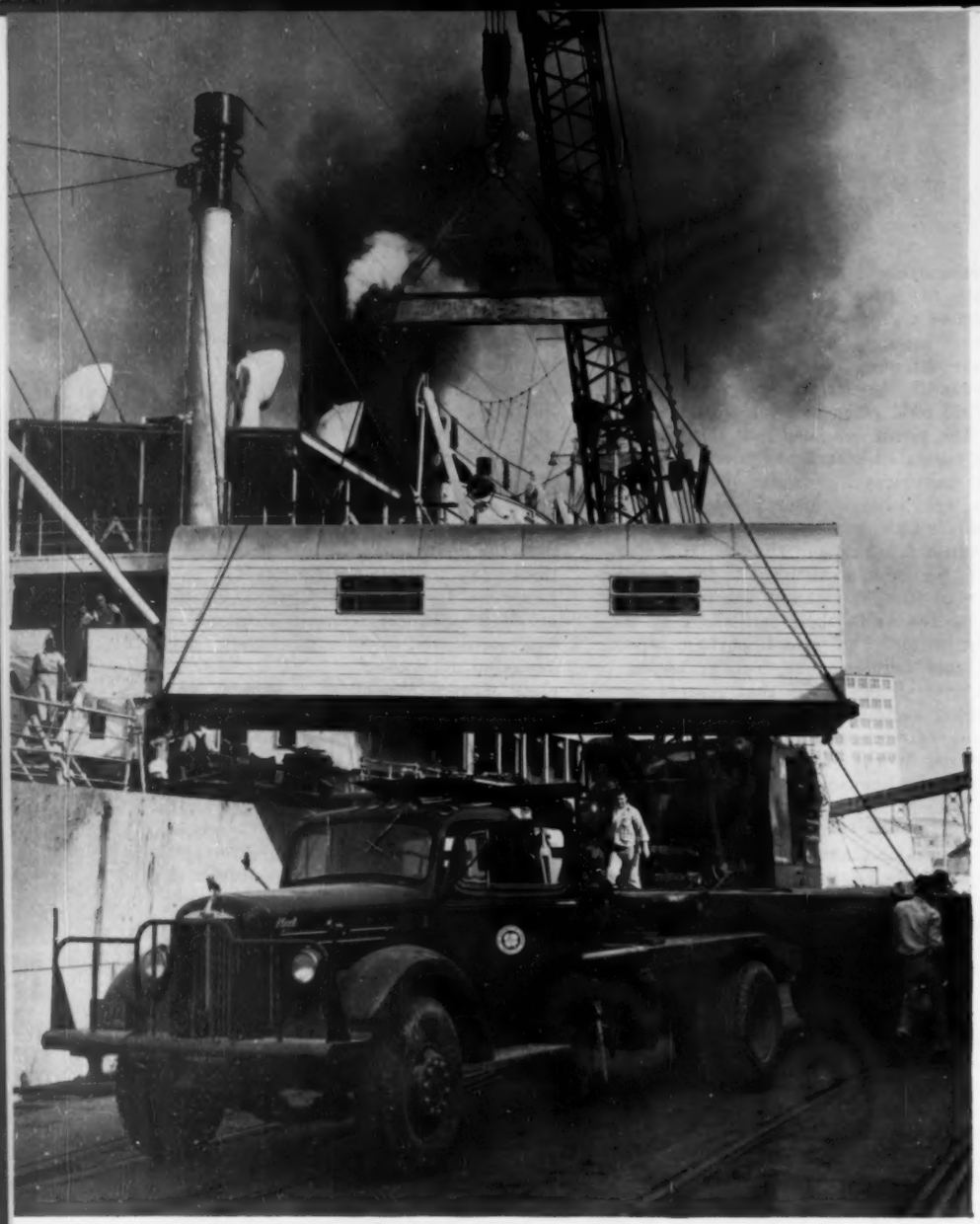
The result has been that the industry in regulated states has been stabilized in many ways. For example, oil purchasers cannot discriminate between wells within a pool. Everyone must be given a fair share of the available market. No one can waste gas in the production of oil. The rights of landowners are respected as to their fair share of the royalty oil. The most important aspect of this regulation is from a national defense standpoint in that reserve producing capacity is created for use in times of emergency. The United States entered World War II with a reserve productive capacity 33 percent above daily demand. This was developed capacity which was immediately available for war use. No amount of undiscovered and undrilled capacity will be of use in any national emergency. Reserve capacity today is only about 15 percent of daily demand. All means should be explored to create a larger developed capacity available within national borders. The simple and effective means are adequate price and market. Domestic producers have traditionally drilled back into the ground over 60 percent of the proceeds from their oil sales. The money available for such use is the product of price times the volume of oil sold. Restrict the price or restrict the market and drilling declines. Nationwide, for every foot of hole drilled 26 barrels of reserve oil has been found. If enough holes are drilled, enough oil will be found. The United States producer has lost his foreign market and now he has been forced to give up about 15 percent of the domestic market due to increasing imports of foreign oil. This condition is not conducive to the full development of domestic crude oil possibilities.

The recent furor in Congress over a small raise in the price of oil was most confusing to oil producers. Costs have increased at least 45 percent since the last price change in 1947, but a price increase of 10 percent led to an investigation. Prices of crude oil and products have always been far less than the real worth of these commodities. At no time has the consumption of oil products been curtailed because of high prices. The only restricting influence on consumption in the United States has been the number of machines available to use oil products. The nation has grown great because it has had machines and the fuel to power them. Its workers produce many times more than those of other countries because they have machines to multiply their efforts. So long as the nation has sufficient fuel, developed and available, so long will it out-produce the world.

Stripper wells should be kept in production as long as possible, as any loss of a national asset is a loss for all the people. Since costs of production are vital to the life of a stripper well, taxes are a significant factor. Recently there have been attempts to reduce or eliminate the depletion allowance in computing income from oil wells for federal tax purposes. Depreciation naturally is set up to provide replacement of physical equipment used in productive wells, but depletion allowances are set up to take care of replacement of exhausted reserves. In computing taxable income from oil wells it is obvious that not all the income from the sale of oil is profit. Some method of recognizing this fact became necessary in computing actual income for tax purposes. The Congress wisely passed laws many years ago allowing a maximum of 27.5 percent of the income from an oil well to be set aside by the owner for the replacement of the oil which is sold from the well. If this allowance stopped when the entire cost of a productive well was returned, there would be no method of recouping the cost of dry holes. Many dry holes are necessary in the course of exploration for new reserves.

Due to certain limitations in the tax laws, the depletion allowance in the case of stripper wells usually varies from zero to 15 percent. This incentive, though small, causes the average producer to spend over 60 percent of his net income searching for new oil. If all his net income is taken up in taxes, very few wells would be drilled, since practically all the capital for new wells is generated within the industry from the sale of oil. It is obvious that any reduction in the depletion allowance would increase the cost of producing crude oil. This increased cost would result in many wells being abandoned much earlier than they would be with the present allowance. Any increase in the overall costs of the producer must eventually be reflected in higher prices to the consumer. For this reason it is to the interest of all the people that this wise provision in the tax laws be retained.

We, in America, have enjoyed the great benefits of cheap fuel from petroleum for so long that it is taken for granted that we shall always have these benefits. If we do not tamper with the basic laws that make this condition possible, it is likely that our present standard of living can be maintained for all the people for an incalculable period of years to come.



Swung by its heavy steel skid foundation, one of the bunkhouses which Glenn McCarthy is shipping to Bolivia for his oil drilling crew is loaded aboard the S. S. Tacoma. Six other specially-built houses go along to be used as bunkhouses, offices, store houses, and combination kitchen, dining room and bath house.

Bolivia hopes for increased oil production

By Dr. J. E. Rassmuss

AVAILABLE STATISTICS on oil production in Bolivia indicate a small gain in output during 1953. For the first half of the year production from the country's three fields is reported at 240,990 barrels, of which Camiri supplied 174,996 barrels, Sanadita 25,700 barrels and Bermejo 40,294 barrels. This represents a daily average of 1,331 barrels. For the months of August, September and October, production is given as 1,554, 1,582 and 1,786 barrels daily, a total of 4,926 or an average of 1,642. In October it was stated that 49 wells were in operation with a daily average of 36 barrels per well. In November production increased considerably in Camiri, raising Bolivia's total output to 2,583 b/d by 51 producing wells.

Since the domestic demand for petroleum is estimated at roundly 3,000 barrels daily, it will be seen that domestic production during the past year provided only a little more than half the country's requirements. The remainder must be imported. Importation and distribution is a monopoly of the government company YPFB (Yacimentos Petroleras Fiscales Boliviano) according to a decree of May 29, 1953. The purchase of imports requires the provision of foreign exchange made scarce by the heavy decline in tin and in mineral prices generally. Consequently, the need of avoiding this drain assumes greater importance and enhances the need of replacing imports by indigenous production if possible.

At present the hope of accomplishing this result rests mainly upon the agreement between the government and Glenn McCarthy, well-known North American oil man, who has undertaken to explore for oil in a region considered favorable

by reason of its geologic structures and seepages which exist in numerous places.

The concession awarded to Mr. McCarthy covers 870,000 acres, located in the Department of Tarija, in a block which extends from a line 10 kilometers north of the Argentine frontier northward to Villa Montes. The southern line is broken to include the southern closure of the Agua Salada structure which is only four kilometers from the Argentine frontier. The western boundary, for about two-thirds of its distance, is formed by the railway from Yacuiba on the Argentine frontier to Villa Montes and Santa Cruz. In its northern part, this boundary is extended further west to include the Monos structure. The eastern boundary is the Pilcomayo river.

The contract requires the organization by the lessee of a Bolivian company with a capital of at least five million dollars (U. S.) within a term of three years.

The lessee is obliged to reduce the concession area by 25 percent during a term of 2½ years and 25 percent in five years. After expiration of a preliminary exploration period of 2½ years, the development period is entered during which the lessee is required to drill at least one well for every 1,000 hectares of the remaining concession.

The royalty to be paid when production is obtained varies according to the average daily production per well based on the monthly yield of all producing wells as follows:

1 to 200 bbl per well	16.5%
201-300 " " "	17.0%
301-400 " " "	19.0%
401-500 " " "	24.0%

and so on, reaching a maximum of 40 percent for 901-1,000 barrels or more, to be delivered at the mouth of the well. If gas is found in commercial quantity a third part accrues to YPFB.

The lessee is obliged to sell to YPFB the quantity of oil necessary for Bolivia's domestic consumption at quoted Gulf prices less 15 percent. All above that amount he is free to export. For a period of five years, counting from the date of beginning export of oil, the lessee is relieved from payment of income tax on profits. He is obliged, however, to sell to the Central Bank of Bolivia the total foreign exchange received from sales of oil, at the highest official rate prevailing at that time, but he is authorized to receive at the same rate all foreign exchange he may need for the development of the concession. The exchange rate for the amortization of capital will be calculated according to the date of its investment and the withdrawing of profits on the prevailing rate on the date of payment.

Duration of the concession contract is set at 35 years and at the end of this term all installations for drilling and production will pass without payment to YPFB and if their value is not then amortized on the books, will be paid at book prices. Pipe lines and installations for other purposes remain the property of the lessee and have to be paid for by mutual agreement.

In supplementary clauses it is established that the properties of the lessee shall not be subject to expropriation or confiscation, or in such case he shall be compensated for the investments plus 15 percent of their value.

The lessee further engages himself, if production reaches sufficient volume, to sell up to 10,000 b/d for the Argentine market at a price to be convened by mutual agreement with YPFB payable in dollars, but his profits shall not be inferior to those he may obtain by sale in other markets.

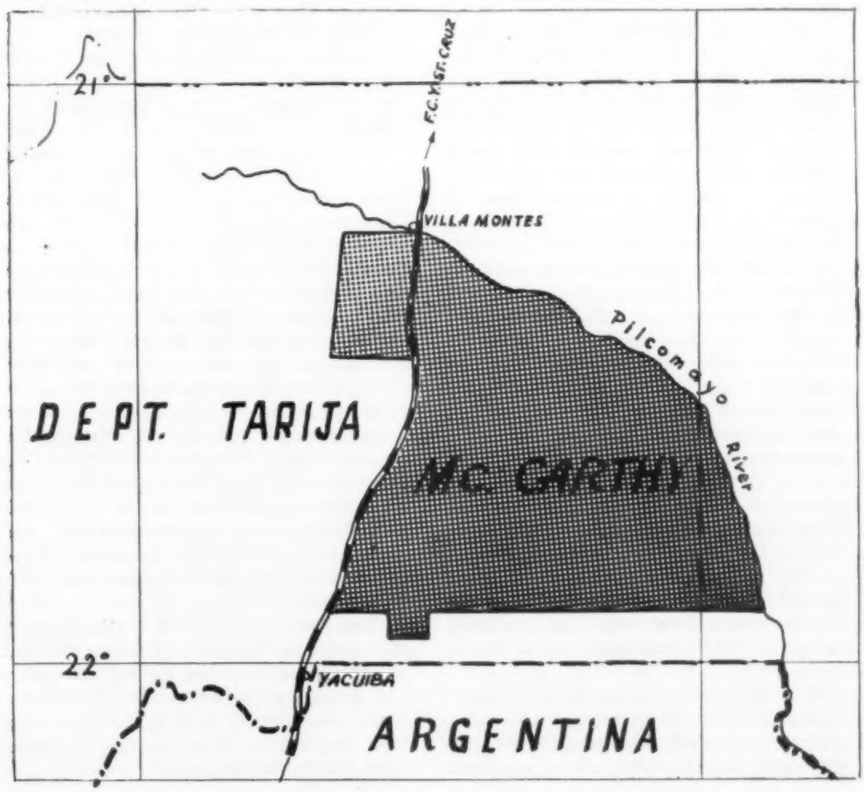
In October last the United States Securities and Exchange Commission authorized the sale of $20 million in shares of Glenn McCarthy, Inc., which was approved also by the Texas authorities, for raising capital of $17 million after deducting commissions, and the first rig and accessory material has been shipped to Bolivia.

Mr. McCarthy arrived in La Paz on January 7 and announced that drilling would begin shortly. He had been preceded by a group of technical experts and drillers. With $1,500,000 worth of machinery already on the ground, it was expected that the first well could be spudded in by the end of January. According to announced plans, McCarthy will remain in Bolivia until the first well is completed.

In case substantial production develops in the McCarthy concession, the railway to Santa Cruz will facilitate transport to the interior and a pipe line to Camiri would connect the southern fields with the new pipe lines to Sucre and Cochabamba and their refineries, nearer to the principal mining region of the Altiplano. The railway to Yacuiba, connected with the northern Argentine railway system, offers an outlet to Argentina, although the distance to the consuming centers of that country adds to the difficulty of marketing there. If the projected pipe line from the northern Argentine fields to Rosario should be built, prospects for moving southern Bolivian oil in that direction will improve substantially.

Another agreement was concluded by the Bolivian government in August with Brazil for the development of a so-called "Comision Mixta" area, reaching from Santa Cruz to Camiri. One million dollars is to be contributed by each country for drilling in that area. As the construction of the transcontinental railway from Santa Cruz to Puerto Suarez and Corumba in Brazil has been completed recently (to be inaugurated by the presidents of both countries), an outlet to Brazil has been provided too, but the great distance by railway transport to the principal cities in Brazil makes substantial exports problematical.

The McCarthy concession in the Department of Tarija, Bolivia, between the Pilcomayo River and the Argentine border.



View of U-15 Unit Rig at site of Wafra No. 4, the discovery well in the field.

Oil from neutral zone enters international trade

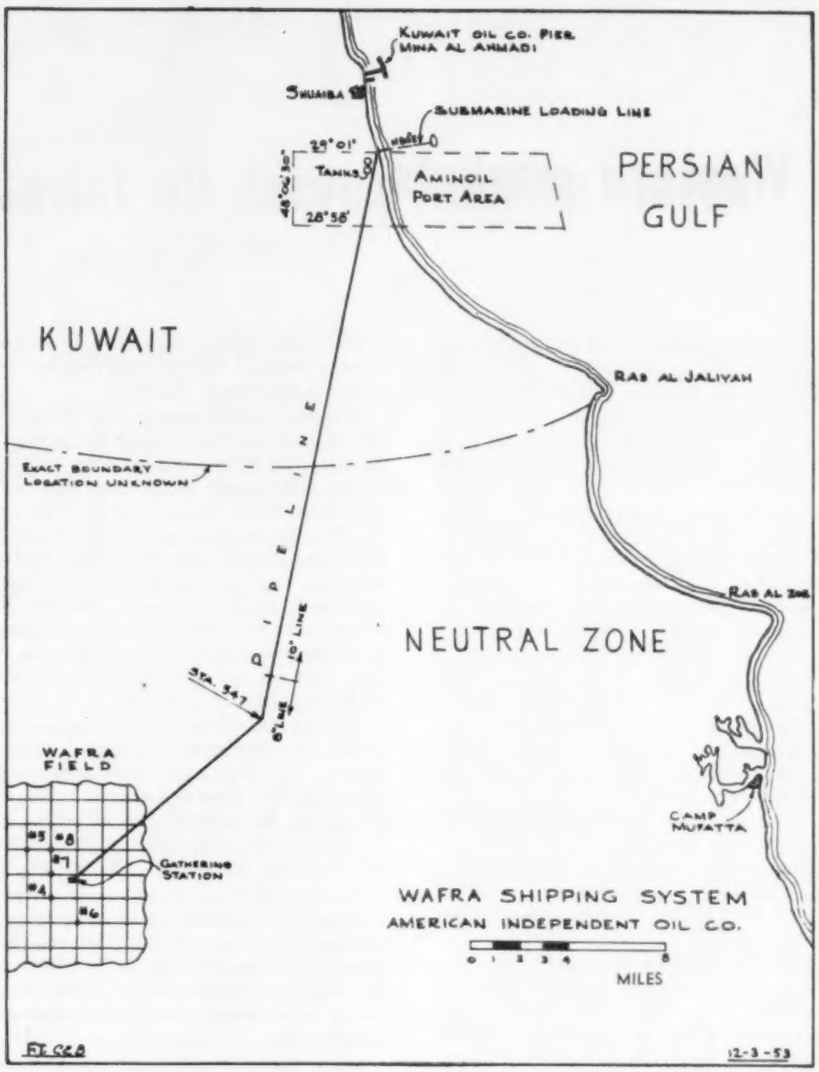
WHEN THE TANKER *Tsuruoki Maru* sailed from the Persian Gulf early in January with a cargo of crude oil loaded from the offshore end of a two-mile submarine line, it signalized the appearance on the international oil scene of a new Middle Eastern field. It also marked the culmination of a $30 million, five-year effort to develop petroleum production in the Neutral Zone, lying between Kuwait and Saudi Arabia on the westward side of the Persian Gulf.

Everything about this newest oil bearing area has a storybook quality. It is a barren, windswept region of sparse vegetation, practically waterless and, until the search for oil began, with no settled population. Transient visitors there were, nomadic Arab tribesmen who found it a convenient location at certain times to graze their flocks. The raids carried on by these tribesmen, both from the north and south, were a cause of constant trouble and bad feeling. To put an end to these annoyances it was agreed by the rulers of the adjoining lands to set aside a section along their common border as a sort of no man's land for which neither need assume responsibility. The agreement apparently was somewhat informal as the limits of the in-between area were not too carefully marked or defined, but since the land itself was considered of no particular value and there were no citizens to be looked after, the arrangement worked well enough. It was not even deemed necessary to give the district a specific geographical name and its designation as the Neutral Zone just naturally grew.

With the discovery of rich oil provinces both in Kuwait and in Saudi Arabia, this attitude of indifference disappeared. To the eager searchers for oil it appeared almost certain, even without preliminary exploration, that the long-neglected area lying between the great Burgan deposit on the north and the numerous prolific fields of the Arabian peninsula to the south must contain oil. The Shaik of Kuwait and King Ibn Saud both reasserted their claims to the Neutral Zone, but even so, it was not deemed necessary to run a dividing line across the area, each ruler claiming an undivided half ownership. It was on this basis that concessions were granted to two separate companies.

In their organization and operation the interests that took up the search for oil in the Neutral Zone differed markedly from earlier adventurers in the Middle East in that none of them was connected with the big international operators who had carried on large-scale developments outside the United States. The first concession, conveying a one-half share in potential production in the Neutral zone, was issued to the American Independent Oil Company organized by Ralph K. Davies, who had been Deputy Chief of the Petroleum Administration for War. Among the companies participating in the ownership of this company, known familiarly as Aminoil, are Phillips Petroleum Co.; Signal Oil and Gas Co.; Hancock Oil Co.; Deep Rock Oil Co.; Ashland Oil and Refining Co.; Globe Oil and Refining Co.; Sunray Oil Corp.; and Laris Oil and Gas Co. Individual share owners are Ralph K. Davies and J. S. Abercrombie.

The other half interest in the Neutral Zone is held by Pacific Western Oil Co., controlled and directed by J. Paul Getty. By agreement between the two proprietors, the work of drilling and operating was assigned to Aminoil acting for itself and for Pacific Western.



The earliest efforts to find oil in the Neutral Zone were somewhat discouraging, though not more so than in other areas that have ultimately proven prolific. The first four wells drilled were dry holes. The discovery well was No. 4 of the wells drilled in the Wafra field. It was brought in a year ago, in March 1953. Since then a development program has been pushed forward and several wells have been completed. The first two gave a potential production of 8,000 b/d and caused the company to move forward with its plans for establishment of pipe line, storage and marine shipping facilities. An additional rig was moved in to aid in drilling and the construction of gathering lines, tankage and other equipment essential to the transportation of the oil was begun while the producing wells were still shut in awaiting provision for shipment.

To bring the oil to world markets as promptly as possible the construction was divided into incremental stages. The initial stage, completed in December, provided capacity to handle the established production of the new field, up to 20,000 barrels daily. It was improvised out of materials that were available with a minimum of delay and was completed in record time. Expansion of the transportation and shipping facilities is scheduled to keep pace with the field's progressively increasing output as development drilling proceeds. Additional tankage is being installed.

The first stage includes at the field gathering center the flow line manifold, two Rolo single-stage field type separators, 55,000 barrels of production tankage, and the pumping equipment necessary to transfer the crude from the gathering center to the terminal at a maximum rate of 20,000 barrels per day. The eight-inch and 10-inch pipe line from the gathering center to the terminal is approximately 34 miles in length.

After extensive coastal and hydrographic surveys, a terminal site was selected on the Persian Gulf coast of Kuwait, about 34 miles from the Wafra field and immediately south of the Kuwait Oil company's marine terminal at Mena el Ahmadi. The Aminoil port has been named Mena Abdulla in honor of the present ruler of Kuwait.

The basic terminal installation consists of two 73,000-barrel cone-roof tanks, three centrifugal shipping pumps and approximately 9,500 feet of 16-inch submarine line. One loading berth is available at the seaward end in approximately 48 feet of water. Loading of crude from shore tankage to tankers moored at the end of the submarine line can be handled at the rate of approximately 7,500 barrels per hour. Suitable lighting and navigation aids, including ship-to-shore radio, have been provided.

With the gathering center, pipe lines and shipping terminal already in operation and with additional drilling machinery installed, development of the Wafra field is proceeding at an accelerated pace in 1954.

Destination of the first cargo of 92,000 barrels was Japan. Subsequent shipments will depend on arrangements made by the owners. American Independent will handle through its terminal Pacific Western's half share of the oil from the Wafra field pursuant to contractual arrangements between the two companies.

Oil in ditch during flow tests on Wafra No. 4.

Converted LST M/V Aminoil moored in Khor at Mufatta, where it serves as camp and warehouse.

Russian oil invades Western markets

THE WESTERN WORLD'S surplus of petroleum in 1953 was increased somewhat by growing exports of the Soviet Union, its principal producing satellite Romania and the Russian-occupied portion of Austria. Between the close of World War II and 1953, the USSR had been importing oil from Austria and Romania and apportioning the exportable remainder to Poland, Czechoslovakia and other satellites which do not have an adequate indigenous supply of oil.

Even before the cessation of hostilities in Korea, however, an exportable surplus appears to have developed. In 1952 shipments from behind the Iron Curtain averaged about 18,400 barrels daily. Of this about 7,000 b/d was shipped to Finland and 8,000 b/d to Italy. All other countries received about 314,000 b/d.

There was a continued growth in communist oil shipments throughout 1953. Average exports to the west have been estimated at 22,000 b/d, but at year-end the volume was about 35,000 b/d, sales activity having been stepped up sharply after the Korean armistice. The 1954 figure may exceed 50,000 b/d.

The sale of Soviet and satellite oil is thought by many to indicate a fundamental change in Kremlin policy. With the ending of hostilities in Korea and the death of Stalin, it is possible that the people are to be given more food, clothing and other consumer goods. To obtain products from abroad, oil appears to have been selected as one prime medium of barter exchance.

Finland has been the most important buyer of Soviet oil in recent years.

Italy began buying some oil from Romania in 1951 and has jumped its purchases since then to nearly 6,000 b/d. Ships are delivered in exchange for the oil. France has bought a similar amount in the latter half of 1953 under agreements to supply industrial equipment. Norway, Sweden, Denmark and Iceland have become customers.

Two recent deals have been reported with German firms. A Frankfort firm is said to have exchanged German industrial products for 66,000 tons of Russian diesel fuel. The West German Official Gazette of October 3 announced the release of 1,275,000 marks for the purchase of 12,000 tons of gas oil by a Hamburg firm.

Heretofore, Soviet oil exports have come almost entirely from satellite countries. Recently the USSR itself has made some deliveries although exports still come largely from Romania and Austria.

It is reported from Austria that the Soviets are producing Austrian oil at a rate more than three times the country's consumption. Because they were unable to move this over-production rapidly enough, the refineries were frequently compelled to close down, and fuel oil was being run into open pits in the ground.

Swiss "fronts" have been employed to dispose of surplus commodities extracted from Austria to the western world.

Soviet production in Austria in 1952 totaled 60,000 b/d and estimates of 1953 production run close to 70,000 b/d. For the first half of 1953 approximately 56,000 b/d are reported, chiefly from the Matzen and Adlerklaa fields.

Soviet exports of Austrian oil from 1945 through June 1953 have totaled about six million metric tons, half in crude and half in refined form. These products are valued at over $117 million. (Crude sells at about $19.50 per ton.)

Fuel oil was taken off rationing in Austria in September 1953, thus abolishing oil rationing completely. The SMOA has guaranteed to deliver to Austria 150,000 more metric tons of fuel oil than originally agreed on for 1953, and has guaranteed the delivery of sufficient supplies of fuel oil at a reasonable price for the next three years. It is reportedly seeking to export over 100,000 tons of Austrian diesel oil and fuel oil to Switzerland and West Germany. The SMOA recently lowered its price per ton on fuel oil from 611 to 503 schillings ($19.35).

Consumption of diesel fuel and gasoline rose in Austria by 12,000 tons to reach 47,000 for gasoline and 48,600 for diesel during 1953's second quarter. Total 1953 consumption is expected to reach 135,000 metric tons of gasoline, 15,000 tons of benzol and alcohol, and 150,000 tons of diesel fuel.

Some indication of the reported recent expansion of the oil industry in Romania under Russian management is seen in the rapid growth of exports from that country. In 1951 shipments to the west averaged less than 5,000 b/d. In 1952 this was more than doubled, rising to 12,500 b/d. Recent reports indicate that the average for 1953 will exceed 19,000 b/d—8,900 b/d to Finland, 5,600 b/d to Italy, 2,300 b/d to Belgium and 2,000 b/d to Sweden.

Romanian publications have been discussing recently the reported rich new oil strike in the Pitesti region.

One article dealt mostly with the housing of workers employed by the new oilfields of the Pitesti region. The location of the fields seems to be some 15 kilometers from Gaesti City, on the road toward Pitesti City, on the right side of the main Bucharest-Pitesti highway. The writer mentions that 52 apartment houses have been built at Valea Caselor for the oil works, plus two large apartment houses, a canteen-restaurant, baths, dispensary, sport grounds and club. Work on the new oil fields started a little over a year ago.

In a recent speech, G. Gheorghin-Dej, Romanian prime minister, quoted figures showing very large gains in the production of coal, lignite, steel and electric power as well as oil. He asserted that oil output at the end of 1953 will approximate 186,000 b/d and that the goal of 220,000 b/d in 1955 is in sight.

It now is asserted that Romanian output averaged 128,000 b/d in 1951 and increased 25 percent in 1952 to 160,000 b/d. The 1953 rate, based on the Prime Minister's announcement, would approximate 170,000 b/d.

These are much higher than had been thought by most observers. They do suggest a reason for the rapid growth of exports even in the face of greater mechanization of farms and industry.

An increase in oil production also was claimed by the Czech government when it announced that the 1953 production plan had been fulfilled by the end of September, three months before the dead-line. Production for the year is given at 575,000 metric tons, made up of 200,000 metric tons of crude and 375,000 tons of synthetically-derived oil products. In comparison, Czechoslovakia produced, during 1950, 63,000 metric tons of crude and 250,000 metric tons of coal-based oil products.

When Russian sales activity was accelerated early in 1953, the basis of trades was reported well in line with world markets. More recently communist oil is said to have been offered at lower prices.

Compared with total demand for petroleum in Western Europe, the volume of oil entering the market is not large. It should not greatly disturb existing markets unless it expands at a greater rate than is anticipated.

Soviet oil serves Russian needs

By Ruth Sheldon Knowles

TO THOSE WHO have been thinking that the Soviet Union is far behind the free world in developing its oil resources, a fresh angle for making the comparison is presented by a newly published book by Dr. Heinrich Hassmann.

This unusual and comprehensive book is characterized as "the best general survey of the Russian oil economy presently available" by Dr. E. DeGolyer, famous geologist and world oil expert.

Dr. Hassmann, currently connected with a German banking firm, was former head of the German Ministry of Economics, subsequently a petroleum economic consultant, and is the author of several books on economic matters and on oil in Germany and the Middle East. Much of his information on Russian oil is not readily available elsewhere. He uses a great deal of official Soviet material and obviously had access to reliable unofficial sources as well. The book was first published in West Germany in 1951 and the translator, Dr. Alfred M. Leeston of Dallas, has brought it up to date with many notes, the latest statistics and a bibliography.

It is a common fault to underestimate Russian resourcefulness as well as Russian resources, for as Dr. Hassmann says, "the Iron Curtain concept that divides the world into two hostile camps is so strongly entrenched in our consciousness that East and West cannot listen to each other without prejudice." Discarding ideology and taking a realistic look at only physical and economic facts, Dr. Hassmann comes up with a surprisingly different picture of Russian oil than we might like to believe.

There have been some newspaper jokes about Russia's five year plans, but there is no cartoon material in the fact that the fourth plan, 1946-1950, exceeded its scheduled production of 248 million barrels by more than 15 million barrels. Furthermore, Dr. Hassmann states, and is confirmed by translator Leeston, that Stalin's demand of 420,000,000 barrels annual production for 1960 will be reached within two years.

In 1950 it took the United States only about seven weeks to produce as much oil as Russia produced in a year, and it took about a week longer to equal the yearly output of Russia's European satellites. But, according to Dr. Hassmann, comparing total Russian production to total American production or world production is like trying to compare an apple with a fish. Russia's production means something entirely different to Russia from what American production means to Americans.

Whereas America depends upon oil and natural gas for over 60 percent of its sources of energy, Russia uses coal and electricity to satisfy the majority of its energy requirements. Add to this the fact that most of America's oil goes into gasoline to keep some 50 million motor vehicles moving while in Russia there may not be more than two million motor vehicles. These contrasts provide Dr. Hassmann's answer. "The Russian economy, due to its entirely different structure, makes requirements on its oil industry lower than those of other countries."

Does current Russian production plus imports (which in 1950 amounted to less than 13 percent of oil produced within Soviet borders) supply Russia's comparatively low oil demand? Dr. Hassmann says yes. Not only for industry, transportation, agriculture and household use, but also enough for the armed forces.

He says the western world is wrong in believing Soviet armed forces are "supermotorized" to the point their oil demands can't be filled even in peacetime. "Out of 175 divisions which made up the Russian land force in 1950, only about 50 were motorized," he says, adding that with a quarter of Soviet oil production allotted to the armed forces, a lot of it may have gone into storage.

All these facts put a new light on Soviet proved reserves. Dr. Hassmann conservatively estimates them at seven billion barrels. Translator Leeston notes the 1952 Soviet technical press estimates them currently at 30 billion barrels. Using Dr. Hassmann's figure, Russia has almost twice as big reserves for her own needs as the United States does for its needs.

Reserves, of course, mean little by themselves. Exploration, discoveries and potential reserves tell the story. Russia has much less to worry about than the United States as far as potentialities are concerned. The vast sprawling Soviet domain contains potential oil resources which, according to Wallace Pratt, famed geologist and world oil evaluator, are "without question potentially far greater than those of any other nation."

That Russia is doing something about those potentialities is clearly documented by Dr. Hassmann. Great emphasis is placed on geological and geophysical exploration. "According to Soviet reports, more than 1,000 geological-geophysical prospecting parties, equipped with modern instruments, are working today in the exploration of mineral resources in the central and peripheral parts of the Union," he says. Soviet geologists have done a creditable job in discovering deposits in the huge Second Baku region, so named for propaganda reasons, as there are many fields in this oil province of 190,000 square miles.

Locations of new discoveries remain secret, but Arctic exploration has a top priority. Hassmann refutes persistent rumors, incidentally, that the southern and western oil districts are no longer the most important oil area; they still supply 60 percent of Russia's production.

"Despite great efforts, there is no doubt that Russian petroleum science and technology are far inferior to American," Hassmann says. Nevertheless they manage to keep up a discovery rate adequate for their controlled but steadily increasing needs.

Russian drilling abilities are not far behind those of American oil companies. In 1950 some wells were drilled deeper than 16,700 feet. In 1949, Russia had in use more than one-fifth of all the rotary drilling rigs in the world. In 1950, 20 offshore wells were being drilled in the Caspian sea off Baku. Since 1944 Russia has been successfully using secondary recovery in the Caucasian region, the Emba district and the oil fields of the second Baku.

Russia had 66 refineries in 1951, built in consuming as well as production centers, capable of a throughput of almost all of Russia's production and with cracking capacity equalling 40 percent of total refining capacity. Synthetic oil production has reached seven million barrels a year, but is still "not comparable to the highly technical and efficient former German synthetics industry" from which Russia captured most of its plants. However, Hassmann predicts it will gain importance once the experimental stage is past.

From a purely Russian point of view, Soviet oil achievements have indeed been "considerable" as Dr. Hassmann expresses

(Continued on page 66)

View of Shell's 3,700 b/d clay contacting unit at Cardon. The most modern of fluidizing techniques is emloyed in handling the finely-divided clay. Clay dosage, temperature, and contact residence time are highly flexible yet closely controlled—ready to be governed by the nature of the feed stock, and designed to yield excellent characteristics of quality, color, viscosity index and stability in the finished products. All photographs with this article are by Elwood Payne for The Lummus Company which designed and engineered most of the processing units in the plant and erected all of them.

Lube oil plant of Cardon refinery

THE REFINERY of Compania Shell de Venezuela is situated at Punta Cardon, on the Paraguana peninsula in Venezuela. The main refinery was erected during the years 1945-1950 and consists of the usual distillation units, cracking equipment and chemical treatment plants for the manufacture of gasoline, distillates and other fueling products.

In addition there is a very complete plant for the manufacture of high grade lubricants, the units of which were the first of their kind to be built in Venezuela. These units were designed and constructed by The Lummus Co. of New York to the specifications of the Bataafsche Petroleum Maatschappij, The Hague, Holland, and consist of a high vacuum distillation unit, a propane deasphalting unit, a furfural extraction unit, a solvent de-waxing unit and a hot clay contacting unit together with the usual accessories of pumps and intermediate tanks.

The total amount of various grades of finished lubes produced is about 100,000 metric tons per year.

The base stock for the manufacture of lubes in this plant is the long residue (reduced crude) produced in the primary distillation units from a light waxy Venezuelan crude produced in the Maracaibo basin, whence it is delivered to the refinery by pipe line.

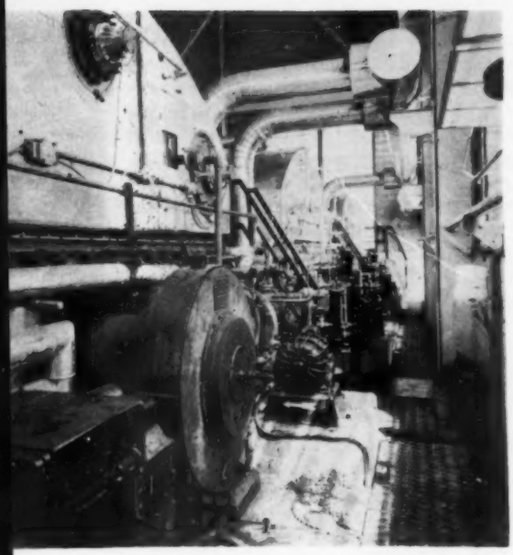
The intake of the high vacuum distillation unit is 20,000 barrels per stream day of reduced crude, and from it are taken an overhead gas oil fraction, four side streams of waxy lube oil distillates and a short residue as bottoms.

The main column of the unit is 17 feet 6 inches in diameter and 145 feet high. It is fitted with 42 trays, some being of the bubble-cap type and some of the shower deck type.

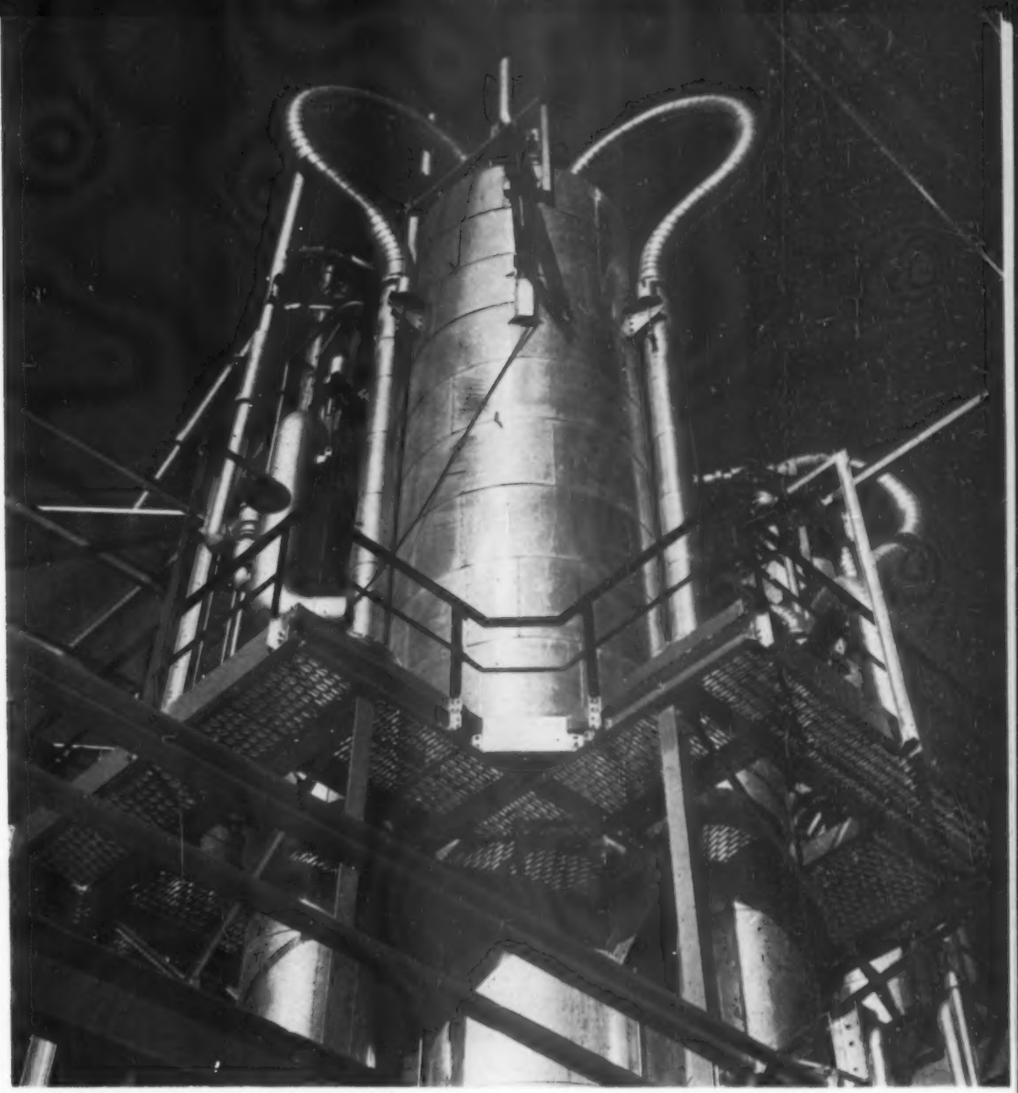
The various products from this unit are further processed in block operation through the ensuing refining units and intermediate tank storage has been erected to accommodate these fractions in sufficient quantities to enable continuous operation of all plants to be carried out.

The first operation in the production of bright stock from this residue, about 2,800 b/d, is that of propane deasphalting. This operation is carried out in a specially designed high pressure tower with working pressure 470 psig in which the short residue is extracted counter-currently with propane. The diameter of this tower is 10 feet and its height 59 feet.

A special feature of the unit is the Lummus-designed propane recovery system from the propane lube oil mix, the system having been designed with a view to high heat economy and high solvent recovery.



Large capacity rotary filters employed in the Shell MEK plant.



Flash fractionating tower for separating solvent from dewaxed oil in the MEK unit.

In this operation the short residue is split up to 45 percent by weight de-asphalted oil and 55 percent by weight hard asphalt. Penetration is below 10 at 25° C.

The de-asphalted oil then goes to intermediate storage for blocked operation together with the waxy side streams from the HV unit.

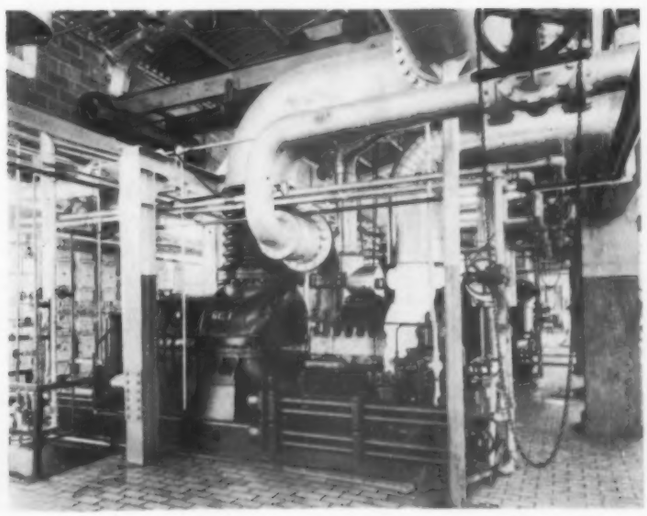
The extractor of the furfural extraction unit is a tower of 11 feet 9 inches in diameter by 114 feet high which is packed with Raschig rings.

The furfural and lube oil fractions pass counter-currently through this tower, the extracted oil (raffinate) and solvent passing out at the top and the extract and solvent passing out at the bottom.

Separation of the solvent and raffinate and of the solvent and extract is carried out in two separate towers, the heat for each tower being supplied by an independent direct-fired furnace.

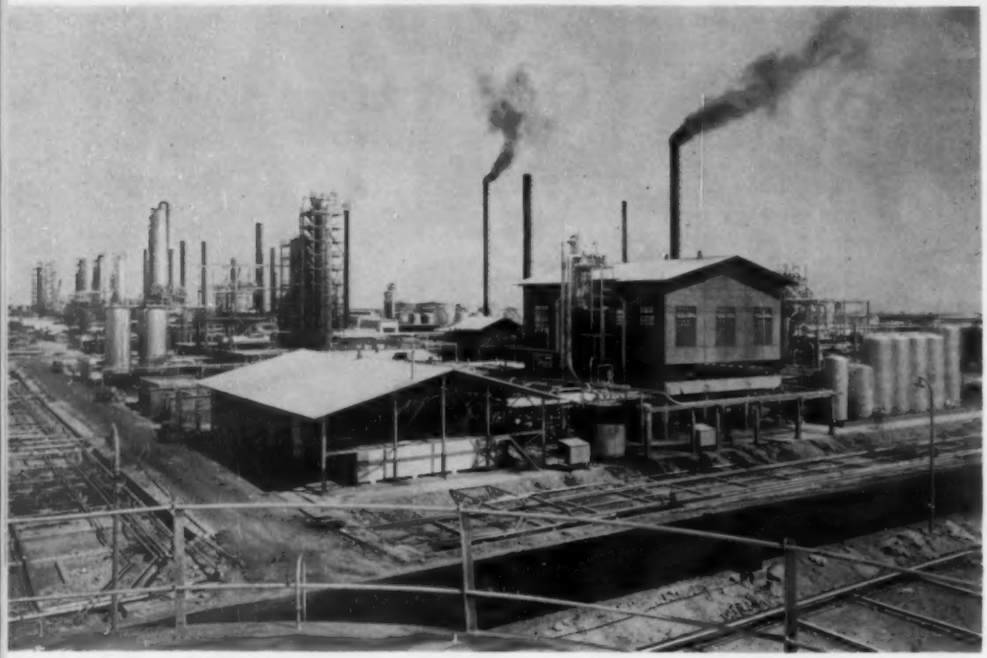
The capacity of the extraction tower naturally varies according to the viscosity of the feed-stock and the percentage of extract taken out. It ranges however from about 4,000 to 8,000 barrels per stream day.

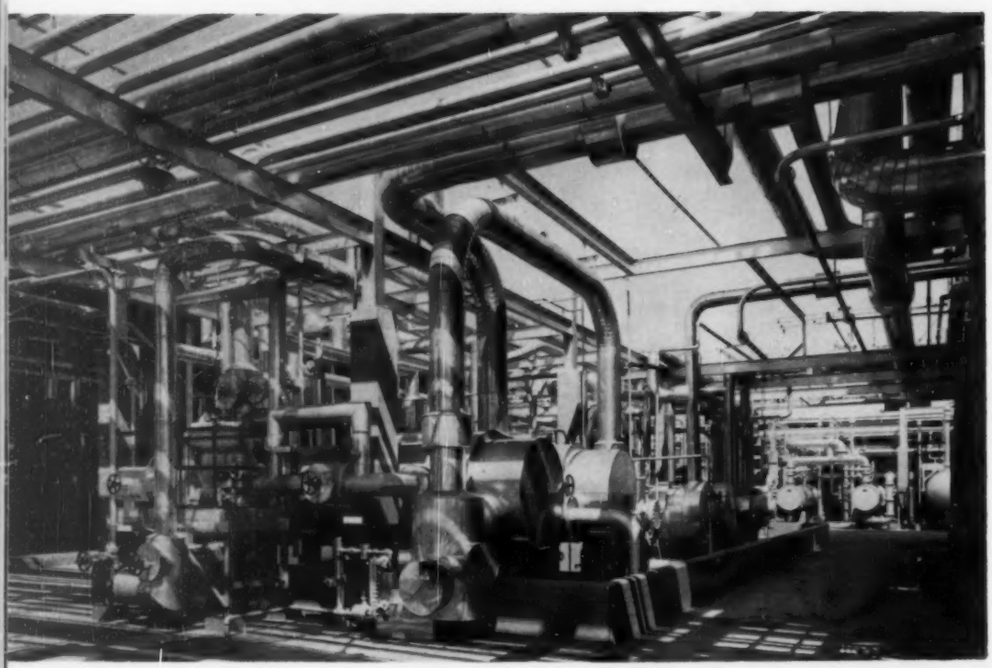
The raffinates pass to intermediate storage tanks for further processing and the recovered solvent passes to solvent storage for further use in the extraction process.



Propane compressors employed to chill the oil-wax mixture to crystallize the wax.

Cardon's MEK dewaxing unit is the largest single unit in the entire Shell refinery, covering an area of about 7,000 square meters. Its capacity is 3,500 b/d. In the photo, the MEK plant is in the foreground. At left is the chiller building; center, the filter building partially hiding the plant's main system of towers and piping.





Heat exchangers and piping are sheathed to protect insulation.

The capacity of the solvent de-waxing unit ranges from 3,000 to 5,000 barrels per stream day according to the viscosity of the feed stock.

In this unit the feedstock is dissolved in a mixture of MEK (methyl-ethyl ketone), benzene and toluene. After solution the mixture is chilled to about 80°F. The oil remains in solution at this temperature while the wax content crystallizes out. These crystals are then separated through a series of six rotary filters.

The oil and wax are then separated from the solvent by treatment in towers, the solvent being returned to storage for further use in the process, while the dewaxed oil and the separated wax go to intermediate storage for final treatment in block operation. The chilling medium used in this process is propane.

The solvent extracted and de-waxed oils are subjected to a final treatment in the hot clay contracting unit. In this unit the oil is heated in a direct-fired furnace to the required temperature, ranging from 350° F to 500° F (117° C to 260° C) according to the viscosity of the feed stock.

The clay is then introduced into the hot oil by a fluidizing system. After contacting, the clay is separated from the oil through continuous working precoat rotary filters. The filtered oil still contains a small quantity of very finely divided clay particles and is therefore finally filtered while hot through blotter presses of the frame and plate type, and thence passes into final storage for delivery.

The separated spent clay still contains some 20-25 percent of oil, part of which is recovered by mixing the clay with water, and then pumping the clay-water slurry into a settling pond when the major portion of the occluded oil separates out and is recovered.

The final loss of oil on the clay contacting amounts to about two percent on the feed. The daily capacity of the clay contacting plant is about 3,500 barrels intake.

All the finished lubricating oils produced at Cardon have a minimum viscosity index of 95.

The total output of the lube oil plant amounts to about 100,000 metric tons per year, approximately 2,300 barrels per stream day, of which about 25 percent consists of bright stock with a viscosity of 175 SSU at 210° F, the average viscosity of all oils produced being 600 SSU at 100° F.

Apart from a small portion used to satisfy local trade in Venezuela, which is blended at Cardon to world-wide Shell grades and packed either into 55-gallon drums or quart tins, the whole production of lubricating oils is exported in bulk as basic grades.

Tank storage for intermediate and finished lube oils is of approximately 125,000 cubic meters capacity.

OIL MEANS MILES

The family car . . .

the modern bus . . . the

diesel train . . . depend on oil

to speed them along mile after mile.

Speed in the oil fields saves valuable rig

time . . . the simultaneous recording of all

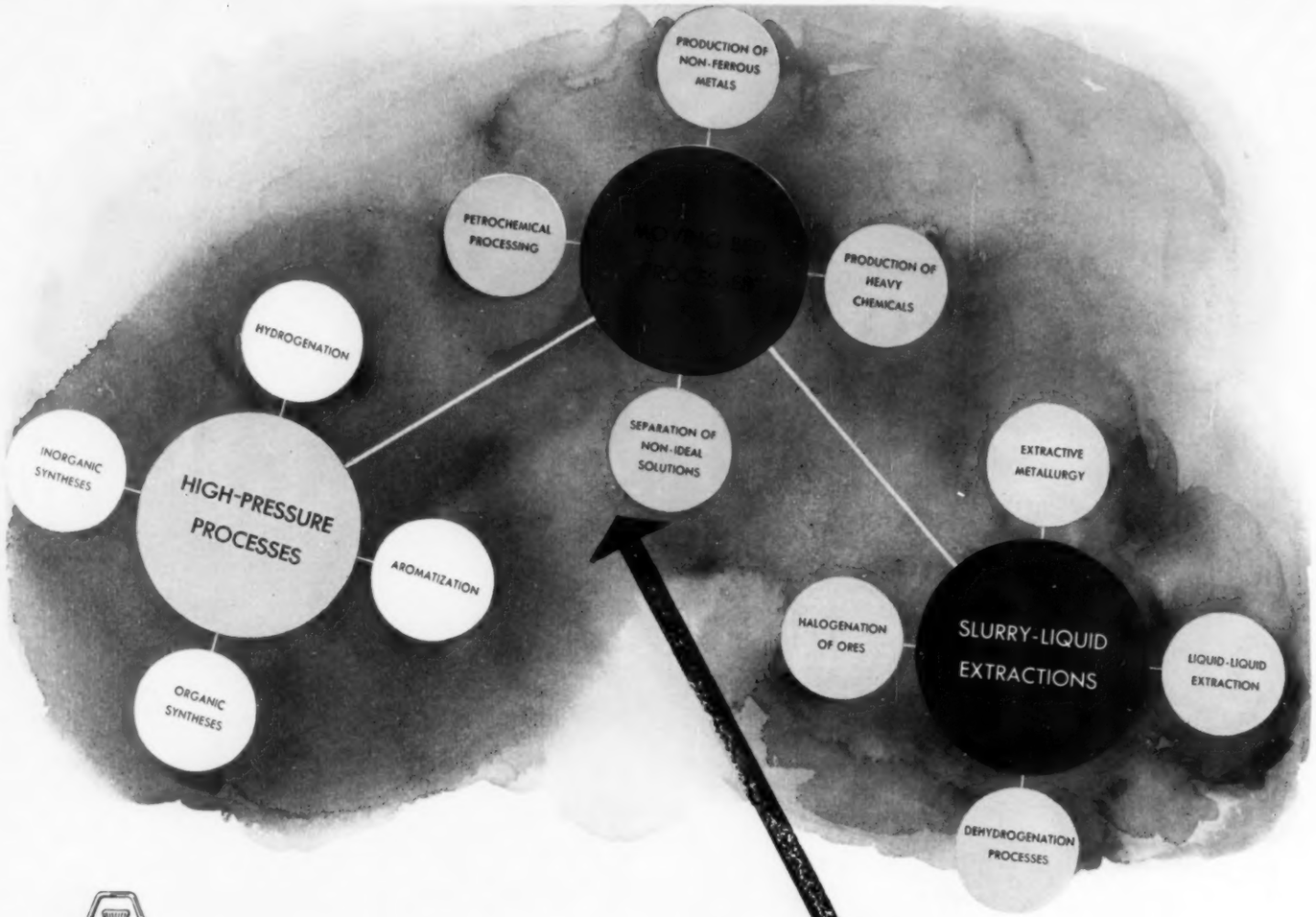
curves permits Schlumberger to immedi-

ately deliver complete electrical log

prints in the field.

. . . and Schlumberger means Service

Schlumberger Well Surveying Corp. • Houston, Texas

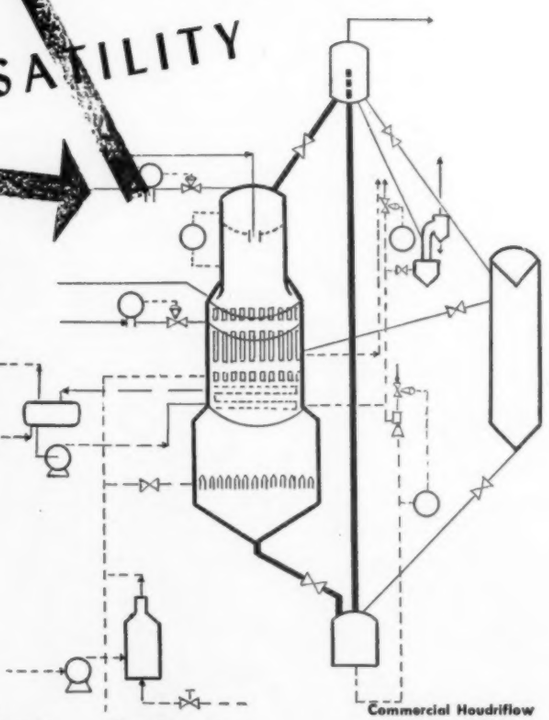


CATALYTIC CONSTRUCTION · 100% ON TIME ·

BALANCE AND VERSATILITY

One important part of Catalytic's balance and versatility is a large staff of process engineers whose broad experience is available to you in the chemical, petrochemical and petroleum industries. They can serve you as an extension of your own personnel or as a total service.

Catalytic has been instrumental in the development of many new processing techniques for the chemical industries. Among other things, our wide experience in the field of the moving bed process may help you with its new and varied applications—a versatile modern method for carrying out chemical reactions or separations. After the process design is developed, Catalytic is equipped to carry out mechanical design and to deliver and construct a facility. We welcome your inquiries.



Commercial Houdriflow catalytic cracking unit

CATALYTIC

CONSTRUCTION COMPANY

1528 WALNUT STREET, PHILADELPHIA 2, PENNSYLVANIA

In Canada: Catalytic Construction of Canada, Limited: Sarnia, Ontario

CATALYTIC *ON-TIME . . . ON-BUDGET* SERVICES for the chemical, petrochemical and oil refining industries

Project Analysis · Process Design · Economic Studies · Engineering · Procurement · Construction · Plant Operation

Shell fits floating base for oil search

FIRST EXTENSIVE SEARCH for oil beneath the waters of the Persian Gulf is being undertaken by the Shell organization. Early in 1952 Shell acquired a concession granted by H. E. Shaik Ali bin Abdulla bin Qasim al Thani, ruler of Qatar (a concession previously held by Superior Oil Co.) to conduct exploration in waters around his domain. On the land area of Qatar peninsula a prolific oil field had been brought into operation by Petroleum Development (Qatar) Ltd., an associate of Iraq Petroleum Co. The first well drilled in that field was brought in as a substantial producer in 1940, but World War II brought a suspension of operations and work was not resumed until 1947.

From that date production increased rapidly and in 1952 exceeded three million tons from 20 wells. The success attending these operations, where oil is found in the Zekrit limestone formation at a depth of between 5,000 and 6,000 feet, encouraged a reasonable assumption that similar conditions might be found to exist in nearby marine areas.

To test this possibility, Shell's exploration division, following preliminary surveys, is preparing to bring into play the most scientific modern methods of exploration, to be followed by test drilling if conditions warrant. Since Qatar itself affords neither food nor equipment for a working party, Shell's first step in preparing for its campaign was to provide a floating supply depot as an operating base. For this purpose the company has acquired a 4,081-ton merchantman, the "McGregor Laird" formerly employed in West African trade runs, which has been appropriately renamed the "Shell Quest" and, having been converted to meet the requirements of its new occupation, sailed for the Persian Gulf in September of last year.

The ship has been completely refitted for her new role by Grayson Rollo and Clover Docks Ltd. at Merseyside, England. Living quarters have been greatly expanded to accommodate about 140 persons. A suitable recreation room has been equipped for their use. Increased refrigerating capacity, air conditioning equipment, workshops, warehouse facilities, water distilling plant and a heavy lifting derrick and pile driver have been installed.

In order to avoid having to dry dock the ship periodically for painting, a system of cathodic protection against corrosion of the underwater portions of the hull has been designed by the owner's marine research and development department in collaboration with the Cathodic Protection Division of F. A. Hughes & Co. Ltd.

The protection current is provided by two special motor generators installed in the ship's engine room which, taking the ship's 200-V mains, convert it to low voltage supply controllable over a wide range.

Four anode groups are suspended over the side of the ship at suitable points and are immersed well below the water line. Each group consists of nine F. A. Hughes Guardian graphite anodes mounted in a steel frame. The nine anodes are electrically connected but are insulated from the frame.

The positive terminal of the generators is connected by single core cables to the four anode groups and the negative terminal is solidly grounded to the ship's structure. Thus the protection current is passed from the anodes through the surrounding sea water and to the underwater portions of the hull. Under normal conditions, 2 kw from the ship's mains will be the consumption of power.

Guardian cathodic protection is being used throughout the world on oil, gas and water pipe lines, water storage tanks, cast iron ships' propellors, floating docks, steel piling for jetties and mooring buoys.

With a full corps of officers and crew to handle the ship and with the supply service organized by the oil company, the technicians aboard the "Shell Quest" will be assured of comfortable living quarters and of space and facilities for carrying on their work. With the system of cathodic protection provided, the need for frequent interruption of the main business of the expedition to repair the damaging effects of corrosion will be removed and it is expected that the vessel will be able to remain in tropical waters as long as necessary without overhaul.

Lowering a remote control gravity meter into the waters of the Persian Gulf.

Lowering one of four anode frames for the cathodic protection system of Shell's Persian Gulf depot ship.

Developments in petrochemicals expressed in recent U. S. patents

By Heinz Heinemann and Felix Heinemann

THE tremendous growth of the petrochemical industry during the last ten years is reflected in the large and steadily increasing number of "petrochemical" patents. Nearly half of all patents issuing which deal with hydrocarbons and other petroleum products and their processing are concerned with products and processes not connected with the refining steps practiced in the petroleum industry for the production of fuels. In view of this large volume of patents which obviously cannot be exhaustively covered within the frame of this review article even for the 15-month period considered (ending December 1, 1953), a rather narrow definition of "petrochemical" has been adopted. Another limitation has been that catalytic processes have been preferentially considered. No claim for completeness can be made. Rather, it has been the authors aim to show up trends and to point out the fields of major interest as evidenced by related work of different groups of workers.

Hydration of Olefins and Production of Alcohols

The production of alcohols from olefins by hydration is one of the oldest petrochemical activities and commercial plants have been in operation for a long time. Even though a very large volume of work has been published in this field, patents are still regularly issuing on innovations.

Two Standard Oil Development Co. patents are concerned with isopropanol production. According to E. H. Amick, Jr. (2,609,400), propylene is absorbed in 60-70% H_2SO_4. An acid extract of 0.5-1.5 moles C_3H_6 per mole H_2SO_4 is passed to a stripping zone and a hydration distillate comprising 3-20% of the propylene in the extract is removed from this zone for isopropanol recovery. The residual acid extract of decreased saturation and increased acid strength is diluted and recycled. E. W. Carrier (2,648,711) is concerned with the production of ether-free alcohol. Olefin hydration is carried out at 200-250°C and 500-1000 psi with an acid catalyst. Reaction products are passed to an intermediate point of an extractive distillation zone without reduction of temperature or pressure. An internal reflux having a water content of 65-99 mole per cent is maintained in this zone. An aqueous solution of alcohol free of ether is withdrawn from the bottom of the zone.

Different hydration catalysts are disclosed in Atlantic Refining Co. patent 2,617,834 (J. E. Woodbridge) which contacts olefins at 25° to —50°C. with an aqueous solution of BF_3 and liquefied sulfur dioxide. C. B. Linn in a Universal Oil Products Co. patent (2,616,933) uses HF as the catalyst.

Larger molecular weight alcohols can be produced from primary aliphatic alcohols containing 2-10 C atoms/mole by condensation at 375-580°C. and 15-1000 psig over soda lime (2,645,667 and 2,645,668, E. E. Burgoyne to Phillips Petroleum Co.). A charge rate of 1-15 moles of alkanol per kilogram soda lime per hour is employed. Soda lime in admixture with copper or chromium oxide may also be used.

The hydroxylation of olefin by heating it in solution with an aqueous solution of hydrogen peroxide at 70-100°C. is the subject of 2,613,223 (D. P. Young to the Distiller's Co.). Tungsten or molybdenum oxide in the presence of sulfuric acid are used as catalytic agents.

Oxidation and Nitration of Hydrocarbons

Oxidation of hydrocarbons is carried out for the production of olefin oxides, of aldehydes, ketones and acids, of phenols and of hydroperoxides which may be used as catalysts or may be condensed to alcohols or converted to phenols and ketones. Olefinic, paraffinic, aromatic and napthenic hydrocarbons serve as feed depending on the nature of the desired product.

Two duPont patents (2,615,899-900, G. W. Sears, Jr.) describe the formation of ethylene oxide by oxidation of ethylene over a silver catalyst diluted by 25-75 volume percent of the composition of granular graphite. The catalyst may contain metal halides. R. G. Egbert (2,653,952 to Chempatents, Inc.) uses helium as an inert gas for diluting the reactants. Reactor effluent from an ethylene oxidation zone is, according to C. J. Thomas (2,622,088 to Phillips Petroleum Co.), contacted with halogenated aromatics, paraffins, naphthenes or ethers boiling at 35-350°C. to absorb ethylene oxide. A portion of the unabsorbed gas is recycled to the oxidation step together with a minor amount of absorbent, which acts as a suppressent for CO_2 formation.

Another process for the production of olefin oxides is contained in M. W. Kellogg Co. patent 2,649,463 (J. F. Skelly). Olefin containing gas is first contacted at 30-150°F. with a halide of copper, platinum, palladium, iridium, aluminum, zinc or silver. The olefin coordination compound formed is oxidized in a second zone at 400-1000°F.

Cuprous oxide is employed as the catalyst for the production of unsaturated aldehydes and ketones in Shell Development Co. patents 2,614,126 and 2,620,358 (K. D. Detling, V. P. Guinn and T. Skei). Olefins with at least 3 C atoms and oxygen are passed over the catalyst at 300-500°C. and the olefin flow is periodically discontinued to clean the catalyst of contaminants. After separation of unsaturated carbonylic compounds from the reactor effluent, the residual gas mixture comprising inert gas, oxygen, carbon monoxide and olefin is treated to selectively oxidize CO to CO_2, whereupon the gaseous effluent is recycled to the catalyst together with make-up feed. The production of alpha-methylene aldehydes and ketones from olefins and oxygen is discussed in Shell Development Co. patents 2,606,932 and 2,606,933 (R. M. Cole, C. L. Dunn and G. J. Pierotti).

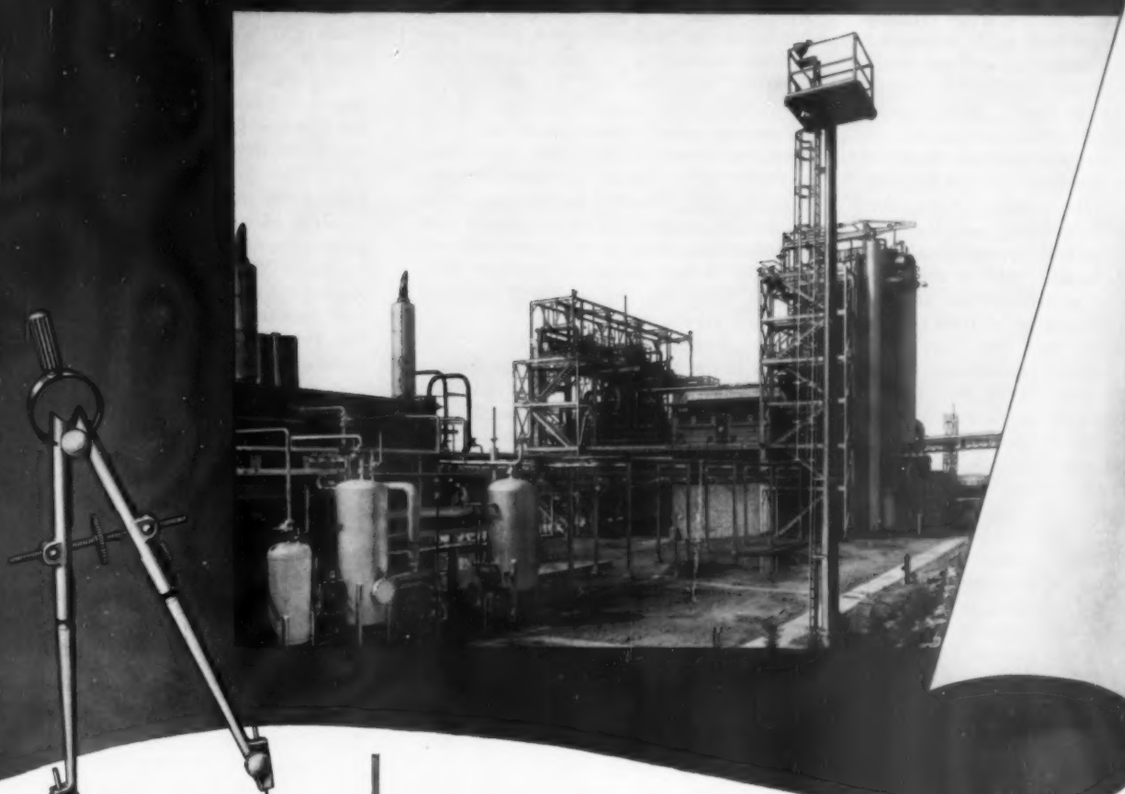
Oxidation of a mixture of paraffinic and naphthenic hydrocarbons boiling above 300°F. to acids which can be converted to polyvalent metal salts is described in Socony Vacuum Oil Co. patent 2,622,092 (A. P. Kozacik and A. N. Sachanen). The oxidized product is treated with an aqueous solution of caustic for saponification and neutralization. The saponified and neutralized matter is separated and acidified, and water insoluble acidic material is treated with an aliphatic hydrocarbon solvent from which the desired organic acidic material is recovered.

Hercules Powder Co. patents 2,628,983-5 (B. V. Aller, R. H. Hall and K. H. W. Turck) deal with the oxidation of benzene homologues to phenols, while the production of maleic anhydride from benzene and oxygen over a vanadium on silica catalyst is described in Monsanto Chemical Company patent 2,625,554 (J. R. Darby). The production of alkylated

(Please turn to page 58)

Naphtachimie

in production with new **SD** *process*



First

in Europe with
Commercial
ETHYLENE OXIDE
by Direct Oxidation

Climaxing 7 years of development, SD's new direct oxidation process for producing ethylene oxide at low cost has now reached successful initial operation . . . at Naphtachimie's new L'Avera plant near Marseille, France, also designed by SD. Naphtachimie is not only first in Europe, but first new producer in the world since 1938 to use such a process. And performance to date, they report, has actually exceeded design specifications. You, too, will profit by utilizing SD's specialized experience in organic chemical plant design. Their services are available to you, on a confidential basis, on any problem involving a process of your own, or one to be procured or developed.

SCIENTIFIC DESIGN COMPANY, INC.
EXECUTIVE OFFICES: 2 PARK AVE., NEW YORK 16, N. Y.
Engineering Offices: Jersey City, New Jersey

phenols in the presence of phosphorus oxyhalide as a catalyst is disclosed by F. Bryner (2,655,547 of Dow Chemical Co.) while G. M. McNulty and T. Gross (2,-655,544 to Standard Oil Development Co.) use BF_3 to alkylate phenols with propylene polymers.

Oxidation of naphthenes to naphthene hydroperoxides is the subject of a group of Phillips Petroleum Co. patents (2,-609,395, 2,615,921, 2,618,662, C. F. Dougherty, Jr., C. C. Chapman and W. M. Hutchinson). A hydrocarbon mixture containing at least 50% naphthenes of 5 or 6 C atoms in the ring and not more than 8 C atoms in the molecule is treated with oxygen under liquid phase conditions. The liquid entirely fills the reactor during reaction and an indirect heat exchange medium is circuitously passed through the liquid. Cycloalkanoles and cycloalkanones can then be produced by reacting the cycloalkane hydroperoxide formed with a stoichiometric excess of a cycloalkane at 160-260°C, and a pressure of 50-1000 psi.

Allied Chemical and Dye Corp. was assigned two patents on cumene oxidation (2,613,227 and 2,619,509, G. G. Joris). The reaction is carried out in liquid phase with elemental oxygen in the presence of solid calcium carbonate and at 90-130°C. The oxidation to cumene hydroperoxide may be carried out stepwise.

Isopropyl benzene hydroperoxide is made by oxidation of isopropyl benzene in liquid state at 105-135°C. in the presence of steam as an explosion inhibitor according to Hercules Powder Co. 2,610,-510 (G. P. Armstrong, T. Bewley and K. H. Walter).

Oxidation of aromatics to hydroperoxides over alkali metal or alkaline earth metal oxides or hydroxide is the subject of Hercules Powder Co. patent 2,632,774 (J. J. Conner and A. D. Lohr).

Relatively few patents have recently issued on hydrocarbon nitration. H. B. Hass and L. G. Alexander (2,609,401 to Purdue Research Foundation) contact paraffins with 1-4 C atoms with oxygen and nitric acid or nitrogen dioxide to produce nitroparaffins. Mole ratios of between 8:1 and 25:1 hydrocarbon to nitric acid are employed. Nitrogen tetroxide is used to produce nitrogen oxide addition products of cyclo-olefins according to Union Oil Co. of California's 2,621,205 (F. F. Doumani, C. S. Coe and A. C. Attane, Jr.).

Oxo Synthesis

The oxo synthesis, involving the reaction of carbon monoxide, olefin and hydrogen and permitting the production of higher aldehydes and alcohols has increased in importance with the increasing demand for such products in the detergent and plastics industries.

Reactions involving the oxo synthesis are covered in a number of Standard Oil Development Co. patents. In 2,623,074 (W. F. Ratcliffe); olefins are contacted with CO and H_2 in the presence of a carbonylation catalyst under such conditions that a major proportion of oxygenated products containing one more C atom than said olefin are formed. The reaction products are contacted with a hydrogenation catalyst under hydrogenating conditions. The liquid products are distilled to obtain alcohols having one C atoms more than the original olefins. The bottoms of this distillation which contain higher boiling liquid products are further treated under conditions conducive to dehydration, reforming and cracking to produce a hydrocarbon product which may be cut to recover a high-octane gasoline. J. K. Mertzweiler and P. T. Parker (2,641,613) conduct the synthesis at elevated temperature and 2000-4000 psi pressure with a catalyst comprising an inorganic salt of cobalt dissolved in an organic solvent which is a carbonylation product. The salt is solubilized by an alkyl ether of ethylene glycol.

The production of alcohols from olefins is the subject of Standard Oil Co. of Indiana's patents 2,638,487 and 2,638,-488 (L. W. Russum, R. J. Hengstebeck and W. J. Cerveny). Olefins are treated with CO and hydrogen (1:1 moles) at 250-400°F. and 2500-4000 psi in the presence of an oil soluble cobalt catalyst. Special provisions are made to remove the exothermic heat of reaction. Aldehydes produced are hydrogenated to alcohols by first removing cobalt catalyst from the oxo reaction products, then passing these reaction products with a hydrogenation gas containing 0.2-3% carbon monoxide to a cobalt on pumice catalyst at 450-550°F. and 850-3000 psi at a liquid hourly space rate of 0.2-1, using at least 20 cft. of hydrogen gas per gallon of aldehyde-containing stream. The CO content of the hydrogenating gas is controlled so as to inhibit hydrogenation of olefins and alcohols to hydrocarbons and permit reduction of aldehydes.

Production of a branched chain heptadecyl alcohol by simultaneous reaction of carbon monoxide, hydrogen, tetraisobutylene and methylacetate at 255-275°C. and 325-1500 atm. pressure in the presence of copper acetate dissolved in the reaction mixture is disclosed in the duPont Co. patent 2,644,844 (R. E. Brooks and R. C. Schreyer). Methanol and the acetic acid ester of branched chain primary heptadecyl alcohol are obtained, which ester is subjected to methanolysis.

Halogenation of Hydrocarbons and Halogenated Products

The number of patents concerned with halogenation of hydrocarbons is steadily increasing. Acetylene or acetylenic hydrocarbons are frequently used as feed stocks. L. Vanhaven (2,610,215 to Solvay & Cie.) simultaneously introduces acetylene, chlorine gas and trichloroethylene into a zone filled with a mixture of tetrachloroethane and pentachloroethane in the liquid phase. By additive chlorination of both acetylene and trichloroethylene, tetrachloroethane and pentachloroethane are formed. These mixed products are subjected to dehydrochlorination, whereby a mixture of trichloroethylene and perchloroethylene is obtained which is separated. A portion of the separated trichloroethylene is returned to the first reaction zone. J. W. Clark (2,626,963 to Union Carbide and Carbon Corp.) produces vinyl fluoride by contacting acetylene and HF with cuprous cyanide on an inert porous solid, while L. Schmerling (2,626,962 to Universal Oil Products Co.) reacts saturated halohydrocarbons with an acetylene in the presence of a Friedel-Crafts catalyst at —30 to 100°C., obtaining a haloolefin of a molecular weight equal to the sum of molecular weights of the reactants.

Halogenation of cyclic compounds is the subject of numerous patents. An apparatus for the production of halo alkyl-benzenes is described in Heyden Chemical Corp. patent 2,608,660 (H. J. Noebels). F. E. Lawlor (2,608,591 to Niagara Alkali Co.) discusses catalytic chlorination of benzene hydrocarbons with liquid chlorine. Production and purification of benzene hexachloride and hexachlorocyclohexane are treated in Ethyl Corp. patent 2,622,105 (L. A. Miller, J. H. Dunn, C. M. Neher and S. N. Hall) and Food Machinery and Chemical Corp. 2,607,723 (J. A. Pianfetti, M. Y. Seaton and A. Williams). Standard Oil Development Co. patent 2,608,590 (H. F. Johnson and H. W. Scheeline) discloses a process of manufacturing bromoxylenes from bromine, air and xylene over copper bromide, thoria and ceria at 300-600°F. A mixture of copper chloride and magnesium chloride on a porous inert carrier can serve as oxychlorination catalyst according to Dow Chemical Co. patent 2,636,864 (D. J. Pye and T. J. West). A method of producing monobromonitromethane by bromination of nitromethane is discussed in another Dow Chemical Co. patent (2,632,776, H. R. Slagh).

Nitriles from Hydrocarbons

The production of hydrogen cyanide is the subject of patent 2,625,463 (C. L. Norton) assigned to the Babcock and Wilcox Co. Hydrocarbon gas and nitrogen are reacted after the nitrogen has been preheated as a component of air in a moving bed type heater. The oxygen in the air is used up in the combustion of fuel employed to supply the heat required in the process.

Patents covering the production of organic nitriles involve reactions of hydrogen cyanide or ammonia with olefins, acetylenes and paraffins. In two

(Please turn to page 60)

Westinghouse Controls Stand Guard

for the Mene Grande "Navy"

Maintenance men ride to work in power launches at Mene Grande's 500-well underwater oil field on Lake Maracaibo in Venezuela. At many of the wells their job is a lot easier because Westinghouse automatic controls stand guard 24 hours a day over continuously operating pumping motors.

This weatherproof oil well pumping control for single-speed, squirrel-cage motors has proved its dependability in operations where it is impractical to post a man at each well. Providing across-the-line motor starting with complete overload and low-voltage protection, this Westinghouse control does more than merely trip off when trouble develops. If a temporary overload occurs, the control keeps the motor operating. If the overload persists, however, the control shuts down the motor before the danger point is reached. Control cabinet is suitable for surface or pole-mounting.

An optional feature of the control which pays big dividends in multi-well operations such as the Mene Grande field is the Westinghouse AM Relay Timer. This prevents system overloads after power failure by automatically restarting motors in staggered sequence.

We'd like to tell you more about this automatic pumping motor control as well as other Westinghouse equipment for oil field electrification. Write for your free copy of our new booklet B-4039.

YOU CAN BE **SURE** ...IF IT'S

Westinghouse

WESTINGHOUSE ELECTRIC INTERNATIONAL COMPANY

40 Wall Street, New York 5, U. S. A.

Sinclair Refining Co. patents 2,623,061; 2,643,266 J. W. Teter and L. E. Olson describe reacting ammonia and olefins over a catalyst consisting of a reduced mixture of cobalt and magnesium oxides supported on diatomaceous earth at 400-725°F. and a pressure above 500 psi. The catalyst may be in the form of a bed of granules or pellets, having an apparent bulk density between 0.75 and 1.3, a surface area in excess of 120m²/g, a sodium content not exceeding 1%, sulfate not exceeding 0.2% and chloride not exceeding 0.1%.

Acetonitrile can be produced from propane and ammonia according to Phillips Petroleum Co. patent 2,642,454 (J. E. Mahan and S. D. Turk). Relative proportions of 1 to 3 moles ammonia per mole of propane are used. The mixture is passed in vapor phase at 800-1000°F. and 15-250 psi for a contact time of 1-6 seconds over a cobalt molybdena-alumina gel, containing 5-25% cobalt molybdate on a dry basis.

The production of acrylonitrile from acetylene and HCN is disclosed by A. F. MacLean and D. E. Pickart (2,621,204 to Celanese Corp. of America). An aqueous solution of a catalyst such as cuprous chloride and NH_4Cl is employed. Reaction products are passed through benzene, toluene, diphenyl ether, diphenyl or isomeric xylenes to separate acrylonitrile from HCN and acetylene. Details of carrying out the reaction of acetylene and HCN over cuprous chloride catalysts are contained in 2,653,965 (R. M. Thomas to Mathieson Chemical Co.) and 2,659,748 (R. A. Franz to Lion Oil Co.)

Cuprous salts in acid solution as catalysts for acrylonitrile production from acetylene and HCN are also employed in Monsanto Chemical Co. patents 2,649,418 and 2,649,472 (C. J. Stehman and G. H. Lovett). Separation of acrylonitrile from other reaction products is accomplished by creating organic and water phases, with the latter containing the acrylonitrile. Tar is removed from the catalyst solution by adding to it a liquid organic compound, boiling above 80°C. and containing a nitro, nitrile, phenolic or keto group.

Halonitriles are the subject of 2,653,963 (F. M. Cowant and J. K. Dixon to American Cyanamid Co.). Olefins are reacted with cyanogen halide in the presence of $AlCl_3$-nitrohydrocarbons at temperatures below the boiling point of the nitrohydrocarbon.

Hydrocarbon Polymerization and Polymers

The largest number of petrochemical patents currently issuing is concerned with polymerization of unsaturated compounds and with polymerization processes. A variety of polymers of different molecular weights and structure is produced for use in the plastics, synthetic rubber and other industries as well as for high octane gasoline ingredients.

Cyclooctatetraene is prepared by tetramerizing acetylene in contact with nickel monocyanide at 90-150°C. and at 100-600 psi pressure (2,613,231; A. J. Canale and J. F. Kincaid to Rohm and Haas Co.). High molecular weight polymers from ethylene, produced at 230°C. and high pressure in the presence of a free radical producing catalyst are the subject of duPont Co. patent 2,645,425 (A. W. Barry). Separation of reaction products is carried out in two stages, which differ in the reaction pressure. T. Boyd (2,650,-913 to Monsanto Chemical Co.) uses a catalyst for ethylene polymerization which comprises 2,2-bis (tert. butyl peroxy) butane. A. N. deVault (2,656,-398 to Phillips Petroleum Co.) polymerizes ethylene at 25-150°C. over palladium oxide on a porous siliceous base. Isobutylene polymerization is discussed in several patents. Of Standard Oil Development Co. 2,644,798 and 2,637,720 (J. D. Calfee, C. A. Kraus, H. G. Schneider and P. W. Brakeley, Jr.), the first describes a hydroxylated aluminum halide catalyst for i-butylene polymerization, which has a chloride to aluminum ratio of between 2:1 and 2.8:1 and is dissolved in methylchloride in a concentration ranging from .4 to .5 g/100 cc. The second patent fractionates a C4 cut from a cracking operation to obtain an i-butylene-rich fraction which is polymerized with boron trifluoride in the presence of 0.1% ether at below 0°C. to polymers of molecular weight 10,000-20,000. Copolymerization of iso-butene and 2-butene can be carried out over silica-alumina promoted with 0.05-10% nickel or cobalt oxide (2,642,467, J. P. Hogan to Phillips Petroleum Co.). The polymer is hydrogenated to a high octane motor fuel. F. G. Ciapetta and W. H. Buck (2,589,189 to Atlantic Refining Co.) disclose a silica-alumina polymerization catalyst impregnated with 0.1-10% of a noble metal. In another Atlantic Refining Co. patent (2,620,364, R. C. Krug) boron phosphate is used as a polymerization catalyst at 150-600°F. A silica gel phosphoric acid catalyst containing 50-90% phosphoric acid is prepared by heating the silica gel for at least two hours to 400-1250°F., then mixing it with the acid, pulverizing, drying at 375-425°F. and calcining the mixture at 600-1000°F. (2,642,402, E. S. Corner and C. S. Lynch to Standard Oil Development Co.).

Several Phillips Petroleum Co. patents deal with emulsion polymerization. In 2,609,366, C. F. Fryling and J. E. Troyan polymerize a conjugated diene at 0° to —40°C. while dispersed in an aqueous medium containing 10-50% methanol to lower the freezing point of the medium below polymerization temperature. An organic hydroperoxide is used as the catalyst. Fryling and Uraneck (2,609,-362) copolymerize 1,3-butadiene and styrene in the presence of ferrous sulfate, sodium pyrophosphate and phenyl (dimethyl) hydroperoxymethane. A similar catalyst combination is described in 2,614,100 (C. A. Uraneck, C. M. Tucker and W. M. St. John). A redox promoter for emulsion polymerization is claimed in 2,615,009 (W. M. St. John, Jr. and C. A. Uraneck). Uraneck and Landes (2,-614,098) employ an organic hydroperoxide having 6-30 C atoms and a water soluble hyposulfite in the polymerization of conjugated dienes.

Emulsion polymerization of conjugated olefins and acrylonitrile in an aqueous medium is discussed in 2,623,032 (F. W. Banes and E. Arundale to Standard Oil Development Co.). Partial polymerization is carried out in the presence of an oxygen liberating catalyst and more nitrile is added before completing the polymerization. Other Standard Oil Development Co. patents include: 2,643,993 (B. R. Tegge) covering the copolymerization of styrene and isobutylene in three stages at —100 to —140°F. with a Friedel-Crafts catalyst and methylchloride; 2,615,004 (G. E. Jasper and L. M. Welch) in which mineral oil soluble styrene-isobutylene copolymers of molecular weight 10,000-30,000 are produced in the presence of a Friedel-Crafts catalyst and a mixed diluent, comprising inert aliphatic hydrocarbons with 2-6 C atoms and chlorinated aliphatic hydrocarbons with 1-4 C atoms/mole; and 2,622,940 in which W. J. Sparks and R. M. Thomas produce a high molecular weight tripolymer from isobutylene, a cyclodiene and divinyl benzene.

Three Monsanto Chemical Co. patents are concerned with catalysts for the polymerization of styrene-type hydrocarbons. 2,620,330 (H. F. Park) employs cyclic succinoyl peroxide; 2,622,077 uses pinacolene peroxide (H. F. Park and H. A. Walter); and 2,647,111 describes a catalyst mixture comprising di-(tert. butyl)peroxide and tert. butyl peracetate (T. Shusman).

Benzoyl peroxide is the catalyst in Dow Chemical Co. patent 2,610,962 (W. H. Smyers and D. W. Young) for the copolymerization of styrene and a styrene-isobutylene copolymer. Alpha methyl styrene is converted to a solid polymer of an intrinsic viscosity in toluene greater than 0.4, while in admixture with finely divided metallic sodium in the absence of an inert liquid (2,621,171, G. D. Jones to Dow Chemical Co.).

Another styrene copolymerization catalyst is described by C. W. Gould (2,612,-490 to Hercules Powder Co.). It is an alpha, alpha-dialkylarylmethyl hydroperoxide in which each alkyl group contains not more than 4 C atoms, mixed with a heavy acetylacetonate. A styrene-butadiene copolymerization process in ethylbenzene solution is claimed in Houdry Process Corp. patent 2,643,257 (W. F. Faragher).

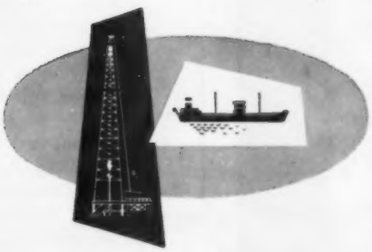
Special types of polyolefinic esters of special alkenyl alcohols are polymerized according to 2,626,945 (F. J. Carlin to

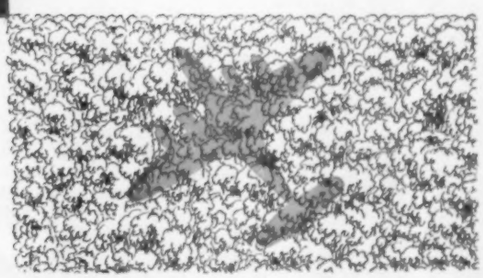
(Please turn to page 62)

STANDARD-VACUUM

When night steals over the paddy fields of Java, kerosene burns in the farmers' lamps to drive the darkness away • When an airliner sets down in Bangkok, hundreds of gallons of high octane aviation fuel pour into the tanks which feed its powerful motors • A road reaches into the back country of Luzon; asphalt from oil gives it a hard, smooth surface • And when a tramp steamer sails from Mombasa, bunker oil may turn the screws as they churn the waters of the Indian Ocean.

From Tokyo to Karachi; from the minerally rich highlands of Southern Africa to the coastal cities of Australia and New Zealand, the varied petroleum products of Standard-Vacuum weave in some way through the whole pattern of living.





STANDARD-VACUUM OIL COMPANY

A name that stands for "Progress" in the East

26 BROADWAY, NEW YORK 4, N. Y.

AUSTRALIA • BURMA • CEYLON • HONG KONG • INDIA • INDO-CHINA • INDONESIA • JAPAN • KENYA • MADAGASCAR
MALAYA • NEW ZEALAND • PAKISTAN • PHILIPPINES • PORTUGUESE EAST AFRICA • RHODESIA • SINGAPORE
SOUTH PACIFIC ISLANDS • SOUTH WEST AFRICA • TANGANYIKA • THAILAND • UNION OF SOUTH AFRICA

U. S. Rubber Co.) in the presence of an initiator and of at least 0.2 moles of cyclohexene or an acyclic alkene of 5-10 C atoms per mole of the ester.

Polymerization modifiers or inhibitors are disclosed in 2,625,538 (Sparks and Nelson to Standard Oil Development Co.) which uses a monoolefin and in 2,613,175 (Johnstone, Webber and Costulow to Phillips Petroleum Co.), where alkali metal or alkaline earth metal nitrite is employed to inhibit butadiene polymerization during fractionation.

Various Chemicals

The production of synthetic drying oils from hydrocarbon materials is usually based on a polymerization process. Since, however, a few patents have recently issued which are primarily concerned with drying oil production, they are treated here separately.

G. M. Verley (2,623,890 to Sinclair Refining Co.) copolymerizes acrylic olefins and unsaturated glycerides in the presence of a Friedel-Crafts catalyst to produce synthetic drying oils. H. S. Bloch and R. C. Wackher in two Universal Oil Products Co. patents (2,622,108; 2,622,109) accomplish the same end by polymerization condensation and hydrogen exchange in the presence of small amounts of HF of mixtures of one mole proportion of certain types of carbonyl compounds and 1-50 mole proportions of a monoolefin with at least 3 C atoms.

Production and utilization of sulfur compounds is treated in a group of patents. H. O. Folkins and E. Miller (2,616,-793 to Food Machinery and Chemical Corp.) prepare carbon disulfide from sulfur vapor and hydrocarbon gas over a magnesia-silica gel catalyst. Mercaptans with 12-18 C atoms are formed by mixing C_{12}-C_{18} tertiary olefins with a liquid alkane-sulfuric acid and introducing hydrogen sulfide at 0-60°C. (2,615,-786, W. A. Proell and W. F. Wolff to Standard Oil Co. of Indiana). Acid activated montmorillonite is the catalyst used by G. H. Short (2,610,981 to Phillips Petroleum Co.) to produce thiols and thioethers from olefins and mercaptans. The production of stilbene from benzyl mercaptan at 150-325°C. in the presence of a sulfactive catalyst comprising essentially sulfides of iron, cobalt, nickel, copper, molybdenum, etc., is disclosed in Standard Oil Co. of Indiana's patent 2,645,671 (L. A. Mattano). Hartough and Lukasiewicz (2,612,505 to Socony-Vacuum Oil Co.) prepare aminoalkyl derivatives of thiophene by condensation of thiophene with formaldehyde and ammonium halide. Alkylatable thiophene and terpenes are condensed to pinyl thiophene in the presence of a liquid catalyst consisting essentially of 85% phosphoric acid according to G. C. Johnson (2,658,901 to Socony-Vacuum Oil Co.).

The separation of isomeric xylenes has assumed even greater importance with the advent of catalytic reforming. Two patents to Sun Oil Co. (2,648,721-3, A. Schneider) describe the separation of o-xylene from xylene mixtures by alkylating the mixture with iso-butylene in the presence of HF. Under proper conditions, o-xylene is selectively alkylated and then separated by fractionation. The product is dealkylated over a cracking catalyst. The production of p-xylene by isomerization of a xylene mixture from which the major part of p-xylene has been removed can be carried out over oxides or sulfides of elements of group VI of the periodic table at 800-1150°F., 50-500 psi and in the presence of hydrogen (2,632,779, R. F. Pfennig to Standard Oil Development Co.).

While detergents continue to be a major petrochemical, only few patents have recently issued in this field: 2,634,-240 (J. C. Showalter and A. J. Schmidl to Standard Oil Development Co.) claims a composition of 10-60 wt.% of alkali metal salts of xylene sulfuric acids, 4-35% of alkali metal salts of alkyl aryl sulfuric acids having 9-16 C atoms in the side chain and 30-60% of a water soluble inorganic alkali metal salt; 2,655,-530 (J. A. Nevison to Atlantic Refining Co.) discusses production of an improved alkylated aryl sulfonate detergent containing not more than 0.1 wt. % of unsulfonated hydrocarbon.

Here's the One bit I use to
CUT
SHOT HOLE
COSTS
U. S. Patent
2,615,684
Others Pending
"Bit costs are a mighty important item nowadays. We want a bit that will stay on bottom longer, making more hole per drill every day. And our company expects us to keep our bit costs down.
"When we find that a Hawthorne 'Blue Demon' can drill 90% of all formations faster than any other bit, at lower cost per foot, we're satisfied. Our company bit records show that they're happy too."
A "Blue Demon", with any thread connection to fit any pipe, and many sets of long lasting replaceable blades, can do the job of many, many drag and roller bits . . . for faster, cleaner, more economical hole.
Factory-controlled "on-the-drill" bit service saves you time and money too. Test and compare "Blue Demon" Bit service, and you'll standardize on "Blue Demons" too.
WRITE FOR ILLUSTRATED CATALOG
HERB J. HAWTHORNE INC.
P. O. BOX 7388, HOUSTON 8, TEXAS
4723

Which of these 22 tube steels will give you maximum tube life per dollar? *Ask the experts!*

This month's report is on: **2% CR.-MO.**

Has intermediate corrosion resistance in combination with good creep strength and fair resistance to oxidation. For use at temperatures up to 1200° F. in cracking coils, reforming units, heat exchangers, vapor line and hot oil piping, and return-bend forgings for oil heaters.

ONE OF 24 TIMKEN HIGH TEMPERATURE STEELS

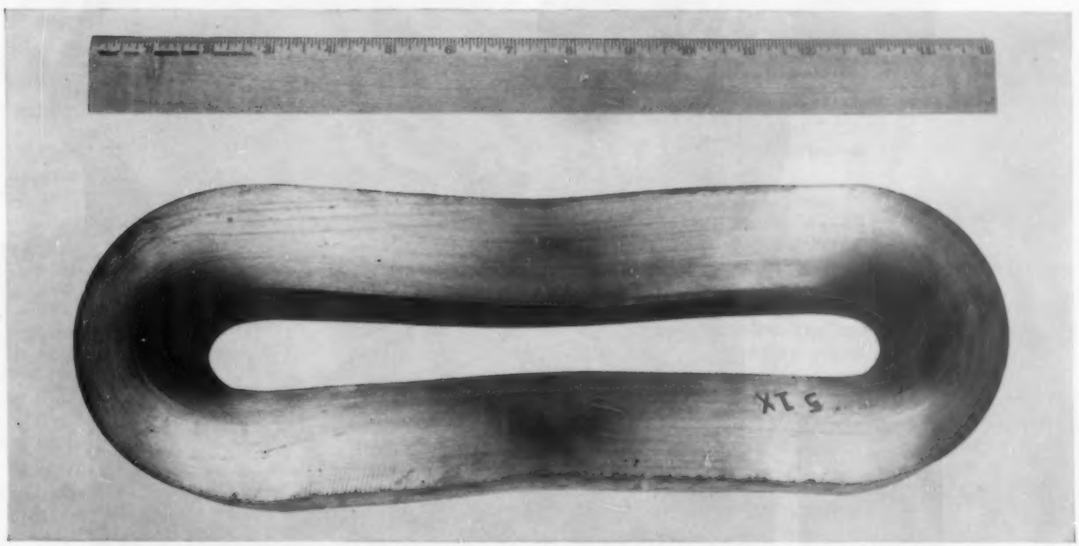
Carbon	Sicromo 2	Sicromo 5S	18-8 Ti
Carbon-Mo.	Sicromo 2½	Sicromo 5MS	16-13-3
DM-2	2½% Cr.-1% Mo.	Sicromo 7	25-20*
Silmo	Sicromo 3	Sicromo 9M	25-12*
DM	4-6% Cr.-Mo.	18-8 Stainless	35-15**
2% Cr.-Mo.	4-6% Cr.-Mo.-Ti.	18-8 Cb	16-25-6**

** Available as seamless tubing on an experimental basis only.*
***Not available as seamless tubing.*

FOR every high temperature application, there's one tube steel that gives you the best life-cost ratio. One steel best answers your particular set of temperature-pressure-corrosion-oxidation conditions. That's why the Timken Company makes the 24 different high temperature steels shown in the box at left.

To find the one best steel for each of your applications, ask the Timken Company metallurgists. They're experts. They know how to balance the various factors against cost—and recommend the analysis that gives you maximum tube life per dollar of cost. They've been doing it for 20 years. And remember—regardless of analysis, you get uniform quality in every Timken® tube because we rigidly control quality at every step from melt shop through final inspection.

Put our "RSQ"—Research, Supply, Quality—to work on *your* tube problems. *Ask the experts!* The Timken Roller Bearing Company, Steel & Tube Division, Canton 6, Ohio. Canadian plant: St. Thomas, Ontario. Cable address: "TIMROSCO".

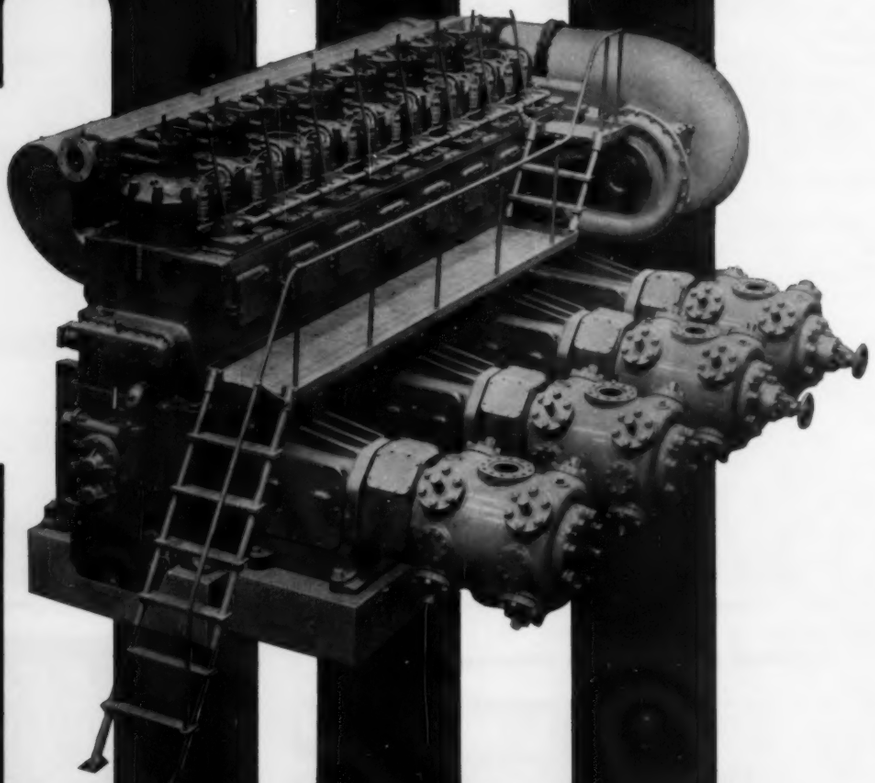


Flattened test of 10½" O.D. by 1.580" wall of 18-8 Cb showing the excellent ductility of large, heavy-wall Timken seamless tubing.

YEARS AHEAD—THROUGH EXPERIENCE AND RESEARCH

SPECIALISTS IN FINE ALLOY STEELS, GRAPHITIC TOOL STEELS AND SEAMLESS TUBING

50%



more power!

with Clark Model TRA Compressors

Delivering substantially more power than any compressors of comparable displacement, the *new* Clark 2-Cycle Turbocharged Gas-Engine-Driven Compressors are the most important development in the industry today.

Boasting a 50% power increase over non-turbocharged units of comparable size, the Model TRA delivers 825 to 1650 bhp per unit. This tremendous increase in output is accomplished with no sacrifice of overload capacity or in the ruggedness and durability characteristic of *all* Clark Compressors. *Actually, for their horsepower, Clark Turbocharged Compressors are the most rugged ever built.* The conservative BMEP rating of 92, together with the massive construction of the Model TRA, bear this out.

Where units of even greater output are required, Clark offers the world's most powerful gas-engine-driven compressor—the Turbocharged Model TLA—rated at 2000 to 3300 bhp per unit. Compared to non-turbocharged compressors of the same displacement, the TLA produces 36% more power at the conservative BMEP rating of 101.

While power output is vitally important in compressor design, economy of operation is even more important. Clark Turbocharged Compressors burn 12½% less fuel and require slightly over half of the cooling water used by non-turbocharged units. From these and other unique advantages, it is not hard to visualize the important savings in installation and operation of Clark Turbocharged Compressors.

For complete details, call your nearest Clark representative or write for Bulletin 130.

CLARK BROS. CO. • OLEAN, N. Y.

DIVISION OF DRESSER OPERATIONS, INC.

SALES OFFICES IN PRINCIPAL CITIES THROUGHOUT THE WORLD

CLARK *Turbocharged Compressors*

Clark sets the pace in compressor progress

Soviet Oil Serves Russian Needs

(Continued from page 49)

it. At the same time, the problems Russia faces are also considerable: shortage of trained technical personnel; lack of exchange of world information; a serious bottleneck in steel supply; transportation and distribution difficulties due to the great size of the country; and a demand already so controlled that in case of war no artificial restriction would be possible without endangering the economic and political position.

Imports from satellites are such a small part of the picture that in order to supply an emergency war demand, the tempting Middle East fields are an obvious political answer. However, Dr. DeGolyer points out that for the same reason that Middle East oil might not be available to the west in case of war with Russia, just so it might not be available to Russia since it is even more vulnerable to attack than the Baku region. "Furthermore, the great current production of the Middle East comes from relatively few wells, wells which could be denied easily," he says.

Dr. Hassmann does not view the Soviet economic system as having greatly hampered Russion oil development—a conclusion which students of liberty will disagree with. It is not blind western prejudice to point out that they have accomplished what they have in spite of their system.

It is just how much Russia has been able to develop her oil resources in spite of her system that makes this book important to American oil men. "The core of the Soviet oil industry will always be the Russian oil fields," Dr. Hassmann says. In peace or in war this solid core is an increasingly vital factor to be reckoned with in world oil affairs as well as in international politics.

The industry is indebted to Dr. Leeston for his fine translation and to Princeton University Press for making it available. Dr. Leeston, author of "Magic Oil—Servant of the World" and "A World Tour of Oil," is an expert in international law and economics and a noted researcher in petroleum affairs and statistics. The use of all these talents makes this volume even more valuable than its original, unannotated edition.

"Oil in the Soviet Union," by Heinrich Hassmann; translated by Alfred M. Leeston; foreword by E. DeGolyer; published 1953 by Princeton University Press; 173 pages; $3.75.

Products Line Completed

Standard Oil Co. (Ind.) has made the first delivery of oil products to River Rouge, Mich., from a 244-mile pipe line just completed from its Whiting, Ind., refinery. The 12 and 10-inch pipe line will let the company make continuous year-round deliveries to the River Rouge terminal, near Detroit. Until now, deliveries made by tankers had to be stopped when the Great Lakes shipping season closed for the winter.

New Norco Chemical Plant

The Fluor Corp. has been selected as engineer contractor for the new Norco, La. plant of Shell Chemical Corp. The Norco plant will produce alkyl chloride and chlorohydrins. Its output will be used to increase Shell Chemical's glycerin production by 25,000,000 pounds per year and to make available substantial additional quantities of epichlorohydrin and Epon resins. Completion in late 1954 is planned.

Vibration Relay

A new protective device, which initiates a signal when excessive vibration due to imbalance occurs in large rotating equipment, has been announced by the General Electric Company's special products section. It is specifically engineered for apparatus which is left unattended for long periods, such as large motors, blowers, steam or gas turbines and centrifuges. The new G-E relay has an operating range which allows its use at speeds from 300 to 18,000 rpm to energize warning-alarm, corrective, or shut-down devices at pre-set vibration acceleration values up to 20g.

Eugene Houdry Honored

Eugene J. Houdry, pioneer in catalytic cracking and inventor of the several processes that bear his name, was recipient of the John Scott medal award for scientific achievement. The presentation was made at a dinner in honor of Mr. Houdry held in Philadelphia on January 19.

The dinner was attended by a large gathering of prominent oil men, the principal address being delivered by Joseph N. Pew, Jr., chairman of Sun Oil Co. which was closely associated with Mr. Houdry in the development of his operations prior to his retirement as president of the Houdry Process Corporation in 1948.

Although Mr. Houdry has ceased active participation in the corporation that bears his name, he is still actively engaged in the development of new methods and applications of catalysts, including the invention of an oxidizing agent to convert carbon monoxide from engine exhausts into harmless carbon dioxide, to destroy unpleasant and harmful industrial odors and to reduce fuel consumption by more efficient combustion and recovery of heat from waste products.

Stanolind May Buy Hydrocol Plant

Guy George Gabrielson, president of Carthage Hydrocol, Inc., has announced that Stanolind Oil and Gas Co. has signed an agreement with the Reconstruction Finance Corp. that may possibly lead to Stanolind's acquisition of the gas synthesis plant of Carthage Hydrocol, Inc., at Brownsville, Texas. Stanolind has begun an investigation of the physical properties and processes of the plants.

Gary Named Chief Executive of Attapulgus

Wright W. Gary has been elected president of Attapulgus Minerals & Chemicals Corp. to succeed Louis R. Streander, retired. For the past eleven years Mr. Gary has been president of the Filtrol Corp. During World War II he was national director of refining for the PAD.

What can be learned from cold in MONTREAL?

One thing is how paint reacts to really icy conditions. In Montreal International have an associated company, and its "on-the-spot" knowledge, combined with the unrivalled technical knowledge of the central factory at Felling-on-Tyne, results in the production of paints that withstand the bitterest winters.

With similar associated companies in 47 other countries, in warm climes, arid and humid climes, *International* have a comprehensive knowledge of world conditions that enable them to provide paints that meet every conceivable need and climate. To the oil industry, for storage tanks, they supply *International* RED LEAD GRAPHITE PRIMER and *International* ALUMINUM PAINT; for general purposes in the oil industry, SUNLIGHT ENAMEL;—and there are many specialties besides.

International Paints Ltd.

Head Office: GROSVENOR GARDENS HOUSE, LONDON, S.W.1.

TELEPHONE: VICTORIA 3161 (10 LINES) TELEGRAMS: CORROFOIL, SOWEST, LONDON

Branches at: Cardiff, Glasgow, Hull, Liverpool, London, Newcastle, Southampton, West Hartlepool.

REGISTERED TRADE MARK

MAIN FACTORY IN U.K. FELLING-ON-TYNE

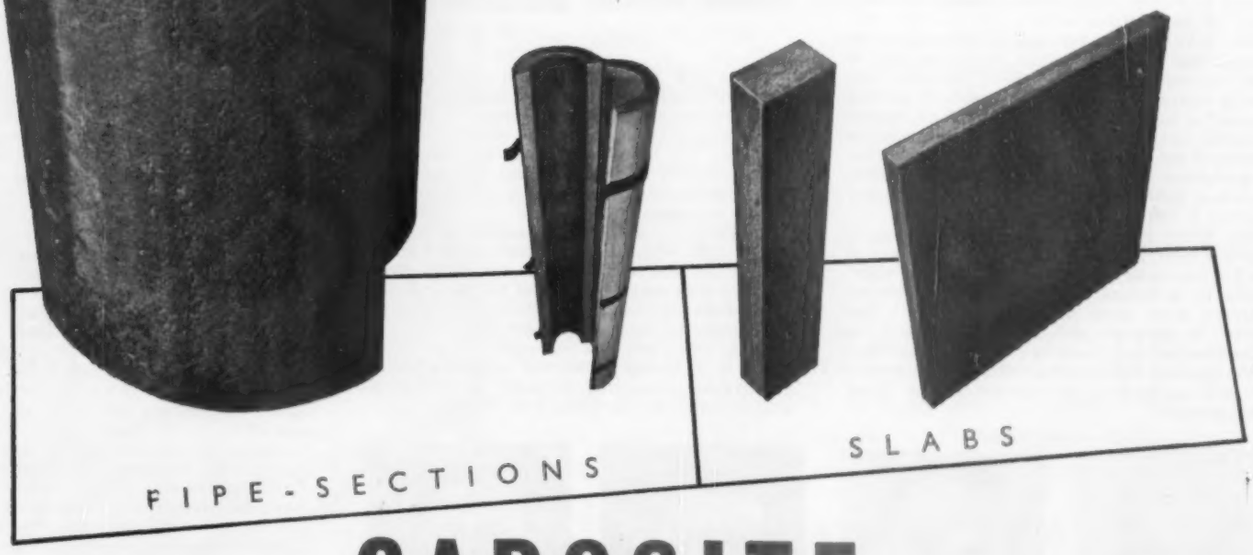
ASSOCIATED FACTORIES AT

BERGEN	NORWAY	KOBE	JAPAN	SAN FRANCISCO	U.S.A.
BILBAO	SPAIN	LE HAVRE	FRANCE	SYDNEY	AUSTRALIA
COPENHAGEN	DENMARK	MEXICO CITY	MEXICO	TRIESTE	ITALY
GENOA	ITALY	MONTREAL	CANADA	VANCOUVER	CANADA
GOTHENBURG	SWEDEN	NEW YORK	U.S.A.	WELLINGTON	NEW ZEALAND
HAMBURG	GERMANY	RIO DE JANEIRO	BRAZIL		

all asbestos

–and a good deal more

CAPOSITE insulation is not just all-asbestos. It is *all-amosite;* amosite being the uniquely long-fibred asbestos—from the Cape Asbestos Co. Ltd's own mines—which makes possible CAPOSITE'S particularly open, cellular texture. This texture gives it a level of thermal insulation which saves over 98 per cent. of uncovered hot surface losses, plus a resistance to the severest conditions of steam heat which enables it to maintain this efficiency almost indefinitely. CAPOSITE pre-formed pipe-sections and slabs are extremely strong, yet light and easy to fit; non-corrosive; and exceptionally economical. Write for full details.



CAPOSITE

100% PURE ASBESTOS INSULATION

The Cape Asbestos Co. Ltd., 114-116 Park Street, London, W.1. Tel: GROsvenor 6022

TA 5065

OIL COMPANY STAFF CHANGES

J. W. THOMAS has been appointed manager, Australian exploration, by West Australian Petroleum Pty. Ltd., an affiliate of the Caltex group. He replaces C. T. Newcomb, who is retiring. An employee of the California Texas Oil Co. Ltd. since mid-1948, when he was transferred from the Standard Oil Co. of Calif., Mr. Thomas served in the New York office of Caltex as assistant manager of producing operations, Bahrain and Australia, before being assigned to Perth in August 1953 as assistant manager, Australian exploration.

Mr. Thomas joined Socal in 1938. Prior to his transfer to Caltex he worked as a field geologist in Arabia and California and geologist on drilling wells and drilling foreman at various fields in California and Washington.

HOWARD E. FELT, vice president of Warren Petroleum Corporation in charge of its liquefied petroleum gas marketing division, will retire on March 1, the 25th anniversary of the date he first joined the corporation. He resigned as vice president on January 1, but remains a director until March 1.

G. L. Brennan, manager of the LPGas division for the past 12 years, has been elected vice president to succeed Mr. Felt.

Fred S. Schwend, assistant manager supplies, was promoted to manager of the division, and K. T. White, for several years head of the division's district office at Houston, was made sales manager.

Mr. Felt joined the Warren organization on March 1, 1929 and, until the corporation's stock was admitted to the New York Stock Exchange in 1945, was one of its three owners. Shortly after joining Warren, he was named secretary, and in 1941 was named a vice president, in which capacity he has directed the corporation's LP Gas division.

Mr. Brennan joined the Philgas division of Phillips Petroleum Co. at Detroit in 1929 and resigned to become organization manager of Warren's LP Gas division in 1941.

Mr. Schwend was formerly a member of the engineering staff of Phillips Petroleum and in 1941 was made a process engineer for plants producing ingredients for synthetic rubber. He was granted a leave of absence in 1945 to become technical assistant to the petroleum butadiene section of the Reconstruction Finance Corp., then as production manager of the petroleum butadiene section of Rubber Reserve. He resigned from that position in December 1946 to join Warren.

Mr. White joined the Warren organization in 1939 and later became one of the first members of the LP Gas sales staff. He held district assignments in Arkansas and Illinois, then directed Warren's large scale entrance into the LP Gas market in the south and southeast before being transferred several years ago to the managership of the Houston district office. Mr. White's promotion will necessitate his transfer to the Tulsa headquarters.

LOVETT C. PETERS has been elected financial vice president of Continental Oil Company. Mr. Peters has been living since 1949 in St. Louis, where he has been financial vice president of Laclede Gas Company.

GAY CARROLL, comptroller of Humble Oil & Refining Co. since 1940, retired November 1 at his request for reasons of health. He has been succeeded by O. L. Luper, former assistant comptroller.

LEWIS McGUIRE, Geneseo, Kan., has been promoted from assistant superintendent to superintendent of Continental Oil Company's East Kansas production district. He succeeds J. P. Neel.

PERCY V. KANE, manager of Sun Oil Company's general wholesale sales department, retired January 1 after 45 years with the company. Mr. Kane, who recently observed his 65th birthday, is one of the few remaining veteran employes who worked directly with the late Joseph Newton Pew, the company's founder. He joined Sun in 1908 when Sun's general office staff in Philadelphia consisted of 16 employees. He has been Sun's general wholesale manager since 1936.

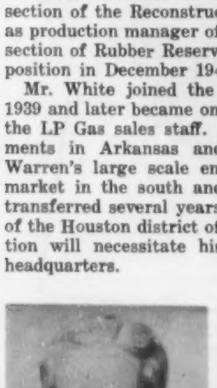
Dr. P. D. Foote

Dr. E. A. Eckhardt

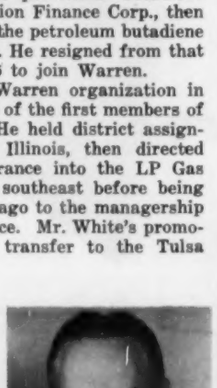
DR. PAUL D. FOOTE, vice-president of the Gulf Oil Corp. and the Gulf Refining Co. and executive vice-president and director of the Gulf Research and Development Co., retired December 31, 1953. Dr. E. A. Eckhardt, vice-president of Gulf Research and Development Co. and associate director of research for that company, also retired the same date.

Dr. Foote joined the Gulf organization in 1927, and in 1933, when the Gulf Research and Development Co. was established, he was made executive vice-president and director of research.

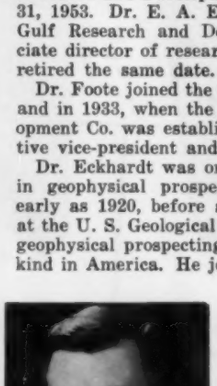
Dr. Eckhardt was one of the world's pioneers in geophysical prospecting for petroleum. As early as 1920, before a colloquium of geologists at the U. S. Geological Survey, he gave a talk on geophysical prospecting, probably the first of its kind in America. He joined Gulf in 1928.



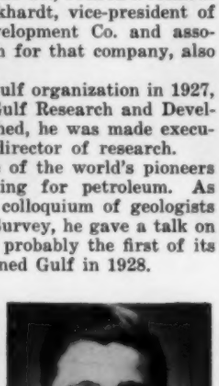
H. E. Felt



G. L. Brennan



F. S. Schwend



K. T. White

O. F. Moore

C. H. Gompf

O. F. MOORE, vice president of the Ohio Oil Co. who has been manager of pipe lines, became manager of the new supply and transportation department on January 1. J. R. Donnell, treasurer, was made assistant manager of the new department.

C. H. Gompf succeeded Mr. Moore as manager of pipe lines. J. H. Rice, division superintendent of pipe lines at Casper, Wyo., moved to the general office at Findlay, Ohio as assistant manager of pipe lines. Clare McElhinny, assistant division superintendent at Casper, advanced to division superintendent, succeeding Mr. Rice.

PETER T. LAMONT and Howard W. Page have been elected directors of Standard Oil Co. (N. J.) effective January 1. This will bring the total membership of Jersey's board to 14.

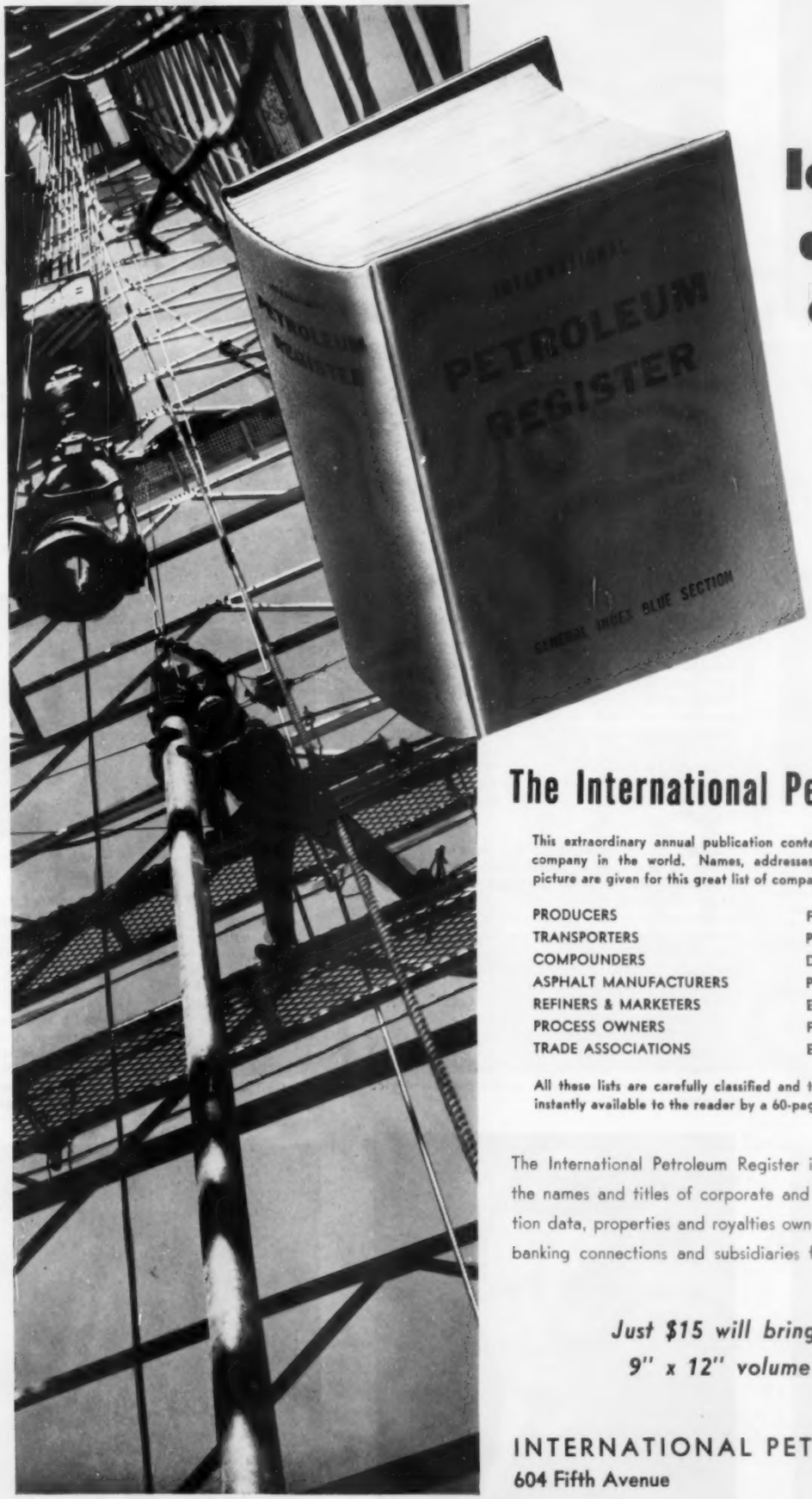
Mr. Lamont has been associated with the Jersey Standard organization since 1922. At present he is Jersey's coordinator of marketing activities. At the outbreak of World War II, he was marketing advisor for affiliates in the southern European area. While in the United States Navy during the war, he served as operations officer in charge of tanker movements for the Normandy invasion and for planning delivery of gasoline and other petroleum products to the Allied beachheads.

Mr. Lamont returned to Jersey Standard as shareholders' representative for European affiliates and in 1946 was appointed marketing advisor for Central Europe. Two years later he returned to New York and in 1949 was made Jersey's over-all marketing coordinator.

Mr. Page, who has been with the Jersey organization for 24 years, has been Jersey's representative in the United Kingdom since 1949. He joined Humble Oil & Refining Co. in 1929 and subsequently worked as a design engineer for Standard Oil Development Co. and for several years in London, Paris and Latin America.

During the war, Mr. Page served with the Petroleum Industry War Council and the Petroleum Administration for War. During the latter part of the war, he was director of the program division of the PAW. Following the war he returned to Jersey as manager of the parent company's coordination and economics department in 1945. Until 1947 he was acting chairman of the Military and Government Petroleum Requirements Committee of the National Petroleum Council. In 1947 he was named executive assistant to Jersey's president.

S. R. McMURRY, manager of Cities Service Oil Co.'s Ponca City, Okla., refinery, has been transferred to the Bartlesville headquarter offices on special assignment. He has been with Cities Service for 30 years. D. R. McConnohie of Bartlesville, assistant to the general superintendent of refining, will assume Mr. McMurry's duties as manager of the Ponca City refinery.



let's get down to earth!

The new 31st edition with revised information about more than 25,000 companies is now ready to help you with your 1954 operations.

The International Petroleum Register

This extraordinary annual publication contains information essential to every oil company in the world. Names, addresses, properties, personnel and financial picture are given for this great list of companies. Contents include:

PRODUCERS	FOREIGN PRODUCERS & RETAILERS
TRANSPORTERS	PIPE LINE CONTRACTORS
COMPOUNDERS	DRILLERS
ASPHALT MANUFACTURERS	PIPE LINE COMPANIES
REFINERS & MARKETERS	EQUIPMENT MANUFACTURERS
PROCESS OWNERS	FOREIGN REFINERS
TRADE ASSOCIATIONS	EXPORTERS

All these lists are carefully classified and the whole mass of information is made instantly available to the reader by a 60-page general index.

The International Petroleum Register is the only directory that contains the names and titles of corporate and management personnel, capitalization data, properties and royalties owned and controlled, number of wells, banking connections and subsidiaries for firms in every major category.

Just $15 will bring this 600-page, 9" x 12" volume to your desk!

INTERNATIONAL PETROLEUM REGISTER
604 Fifth Avenue New York City 20

H. A. Jackson

HARRY A. JACKSON has been appointed a vice president and chairman of the operating committee, eastern division, Tide Water Associated Oil Co. He will succeed Drew L. Hines who retired. The appointment of Mr. Jackson was effective January 1.

Mr. Jackson has been with Tide Water Associated for more than 30 years, commencing as a plant clerk in the sales department in California. Since 1947 he has served as president of Seaside Oil Co., a California subsidiary.

R. W. McOmie

P. J. Merkus

R. W. McOMIE, manager of Shell Oil Company's Wilmington, Calif. refinery, has been appointed manager of the new Shell refinery at Anacortes, Wash. P. J. Merkus, assistant to the vice president in charge of marketing, succeeded Mr. McOmie as manager of the Wilmington refinery. While the refinery at Anacortes is being built, Mr. McOmie will devote his full time to coordinating various activities in connection with the project and developing and training the operating organization.

HAROLD G. TEVERBAUGH has resigned as project engineer with Sunray Oil Corp. to become assistant manager of the gas division of Texas Natural Gasoline Corp. Prior to his employment with Sunray, Mr. Teverbaugh was associated with Stanolind Oil and Gas Co.

H. G. Teverbaugh

R. A. Munro

R. A. MUNRO has been appointed sales promotion manager of Regent Oil Co. Ltd. He began his career in the oil industry in 1932 when he joined the Standard Oil Co. of California, later being transferred to the sales promotion department of the California Texas Oil Co. He has worked previously in the United Kingdom and has also had sales experience in Hawaii and Holland.

E. J. WEBSTER, sales manager of Phillips Petroleum Co. since 1940, has been promoted to manager of the sales department effective January 1. E. H. Lyon, assistant sales manager, has been promoted to succeed Mr. Webster as sales manager. Both men will remain at Bartlesville, Okla.

Mr. Webster was sales manager of the Winters Oil Co. at Kansas City, Mo., when the firm was purchased by Phillips in 1929. He was transferred to Bartlesville as assistant to the vice president in charge of sales in 1939 and was promoted to sales manager the following year.

Mr. Lyon joined Phillips in 1929 as a district salesman in Amarillo, Tex. He was division manager at Wichita, Kansas for nine years and since 1943 has been at Bartlesville as assistant sales manager.

JOHN E. SWEARINGEN has been elected vice president in charge of production of Standard Oil Co. (Ind.). He will have charge of production, crude oil supply, and products pipe lines. He will coordinate activities of the parent company with such principal subsidiaries as Stanolind Oil and Gas Co., Service Pipe Line Co., Stanolind Oil Purchasing Co., and Utah Oil Refining Co. He had been general manager of production for Standard since 1951 and was transferred in 1947 to the manufacturing department of Stanolind Oil and Gas Co. He became assistant to the vice president in charge of operations in 1949 and a year later manager of the company's central division. In 1951 he was made assistant to the executive vice president and a director.

J. E. Swearingen

C. P. Bristol

C. P. BRISTOL, Shell Oil Company area manager at Tulsa, Oklahoma, has been appointed vice president in charge of the company's Tulsa exploration and production area. Mr. Bristol started full time employment with Shell in 1931 as a field engineer. In 1944 he became division manager in the East Texas area and three years later was appointed chief exploitation engineer at Houston. He became production manager at Houston in 1950 and the following year moved to Tulsa in the same capacity. He was appointed area manager at Tulsa last August.

E. J. Webster

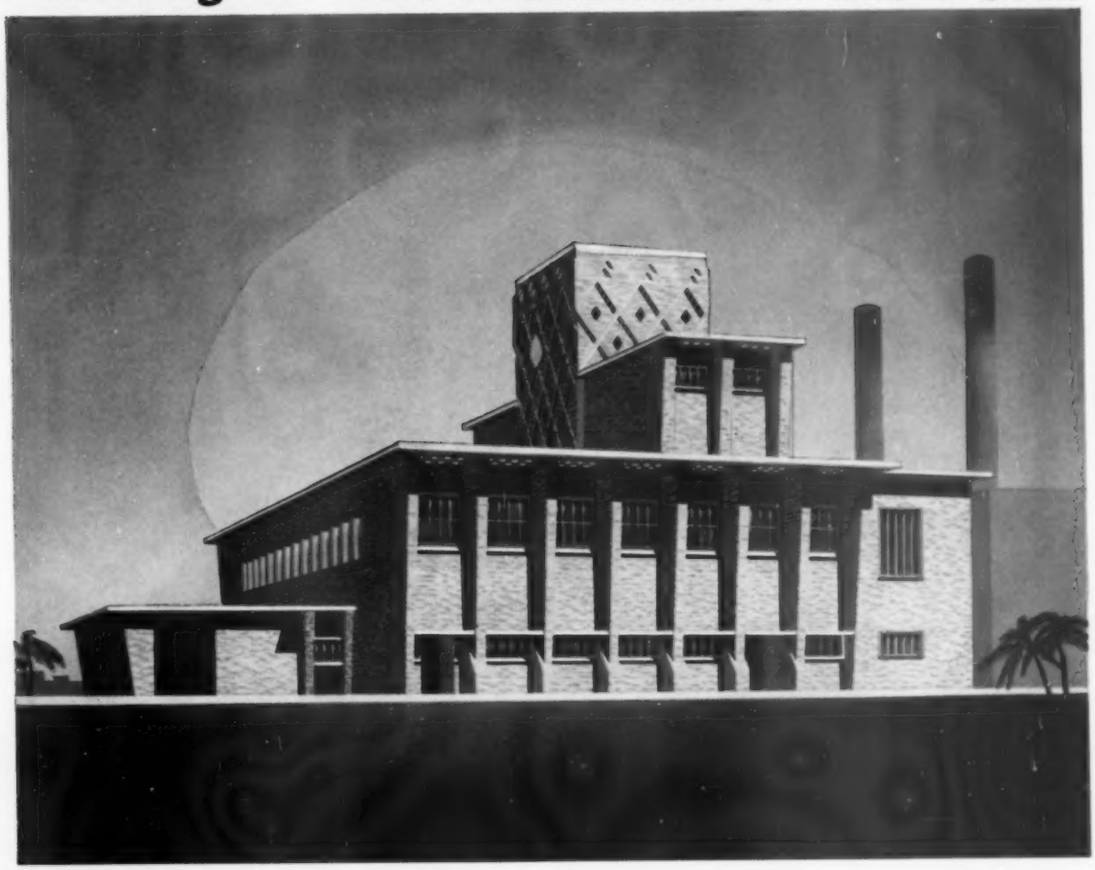
E. H. Lyon

K. R. GERHART has been appointed assistant superintendent of the Continental Oil Company's Chicago petrochemical plant. He is succeeded as process-sales service engineer at the Baltimore petrochemical plant by R. L. Kylander, Ponca City, Okla.

H. M. BAYER has been elected a vice president of Gulf Oil Corporation in charge of the company's Forth Worth production division succeeding F. J. Adams, retired. A veteran of 29 years with Gulf, Mr. Bayer is a geologist. He was manager of exploration in the Fort Worth production division.

H. M. Bayer

Building for the Industries of the World



WATER

Kuwait Seawater Distillation Plant to the design of the Consulting Engineers,
Ewbank & Partners, and Architects, Farmer & Dark, F/F.R.I.B.A.,

was constructed by

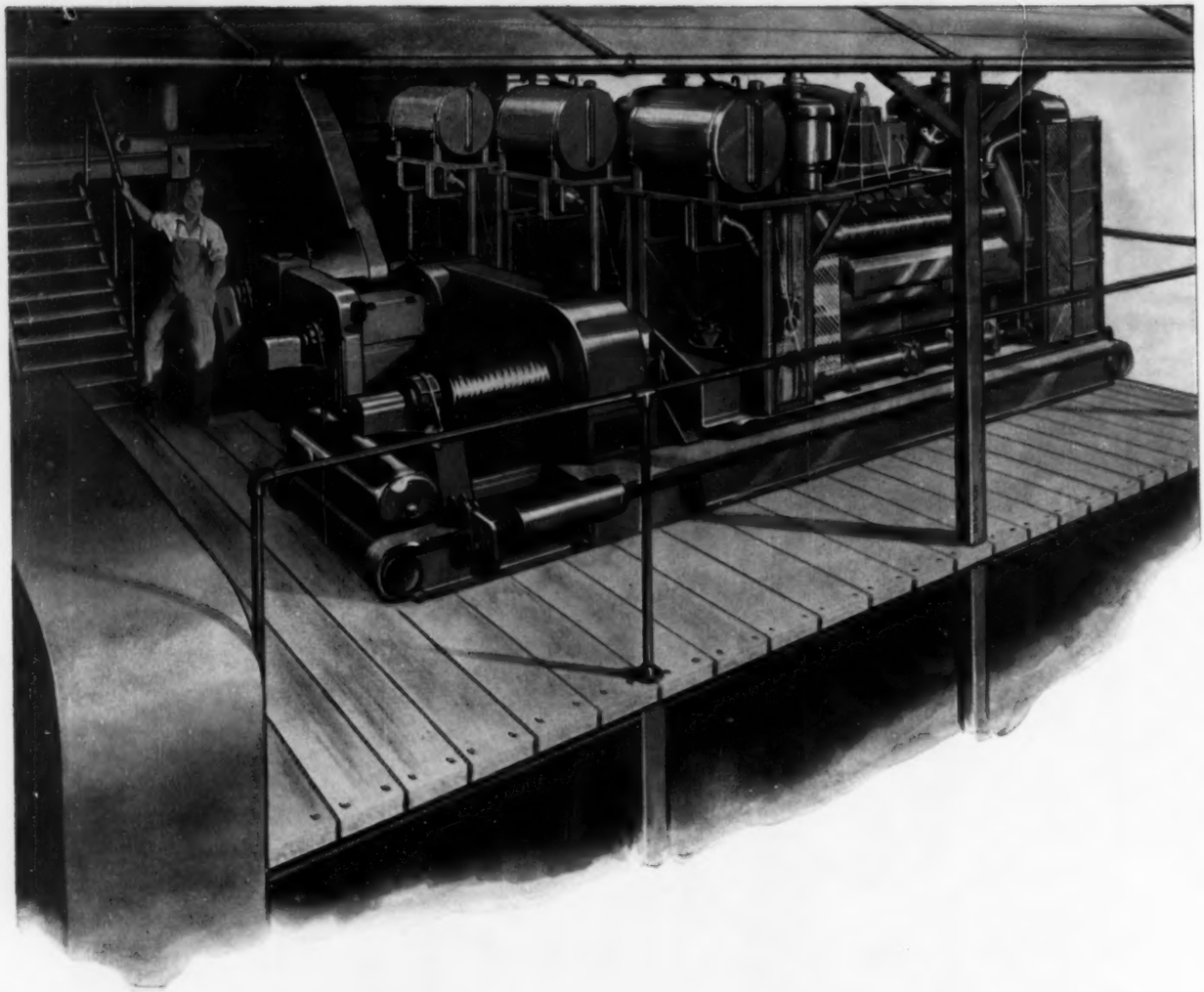
THE GULF ENGINEERING COMPANY (KUWAIT) LTD.

part of the organisation of

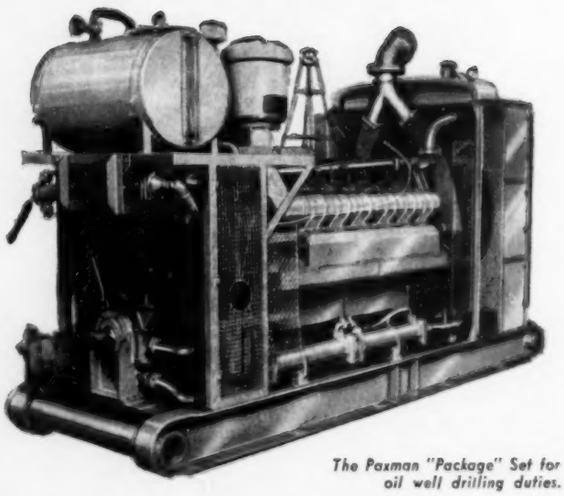
RICHARD **COSTAIN** LIMITED BUILDING & CIVIL ENGINEERING CONTRACTORS

DOLPHIN SQUARE, LONDON, S.W.1 VICTORIA 6624

BRANCHES: MIDDLE EAST · RHODESIA · NIGERIA



Paxman "Package" Sets for oil well drilling duties have a shaft horse-power range of 130-665 h.p. and are easily adaptable for almost any type of drilling rig. They are mounted on a skid type base for ease of handling on and off transport, and robust design ensures continuous hard service with minimum attention.



The Paxman "Package" Set for oil well drilling duties.

PAXMAN *diesel engines for oil well drilling*

DAVEY, PAXMAN & COMPANY LIMITED COLCHESTER *(ASSOCIATED WITH RUSTON & HORNSBY, LTD., LINCOLN)*

C. P. Sappington *T. O. Hall*

Elected to General Geophysical Offices

Chester P. Sappington has been elected chairman of General Geophysical Co. and T. O. Hall has been elected president. Mr. Hall succeeds the late Earle W. Johnson, founder of the company, who died recently. Kenneth R. Wells was elected vice president and A. B. Grubb was re-elected secretary-treasurer.

Mr. Sappington formerly was vice president and has been a member of the firm since 1940. Mr. Hall also was a vice president and has been with General since 1938.

Construction Brochure

A 24-page brochure covering engineering and construction activities in the petroleum, chemical and petrochemical fields is being distributed by the Fluor Corp., Ltd., 2500 S. Atlantic Blvd., Los Angeles.

The brochure contains photos and descriptive material on gasoline plants, refineries, petrochemical process plants, catalytic cracking units and compressor stations. The various applications of cooling towers, air-cooled heat exchangers, heavy duty mufflers, pulsation dampeners and gas cleaners in petroleum and petrochemical process plants are illustrated.

Geiger Heads Davison Chemical

Marlin G. Geiger, vice-chairman, was elected president and chief executive officer of The Davison Chemical Corp. at the directors' meeting following the resignation as president of R. L. Hockley. Mr. Geiger joined Davison as executive vice president on January 1, 1947. He was elected a director in that year and on October 30, 1951 was elected vice chairman with executive responsibility for all research and development, chemical operations and engineering.

M. G. Geiger

Molecular Vacuum Gage

A new molecular vacuum gage designed to measure pressures without external detectors has been announced by General Electric Company's meter and instrument department. The instrument is available in two types, both covering the range of 0-20 millimeters of dry air. One is calibrated directly for dry air and the other has a linear scale for use where individual calibration for dry air or other gases is preferred.

Keel Laid for Tide Water Tankers

Keel was laid recently for the first of twin tankships to be built by Bethlehem Sparrows Point shipyard for Tide Water Associated Oil Co. for use on trans-ocean and coastal runs in the Pacific Ocean.

Delivery of the first finished ship is expected in June 1954. The new ships will be of about 16,000 dwt capacity, 514 feet long, with beam of 68 feet, 30-foot draft, and capable of carrying 131,000 barrels of oil. They will have a speed of about 16 knots, will be capable of carrying 6 different types of liquid oil products at one time, and will be equipped to discharge 23,000 barrels per hour.

Shell Forms Ammonia Division

Shell Chemical Corp. formed an ammonia division January 1 with headquarters in San Francisco. Its formation follows the opening December 11 of the new Shell chemical ammonia plant at Ventura.

G. R. Monkhouse, vice president of the company, has been appointed to head the new division. L. M. Roberts, general manager of manufacturing in the company's New York headquarters, will go to San Francisco as the new division's operations manager. V. C. Irvine has been designated sales manager of the ammonia division.

G. R. Monkhouse

L. M. Roberts

OSBORN – OHIO

CAST WELDING TYPE RETURN BENDS

- LONGER LIFE
- LOWER COST
- HEAVIER WALL
- SHORTER CENTRES

TYPE 1001-W.2. Has one cleanout opening only opposite tube hole, so that by using on alternate end of furnace, each tube can be effectively inspected and cleaned.

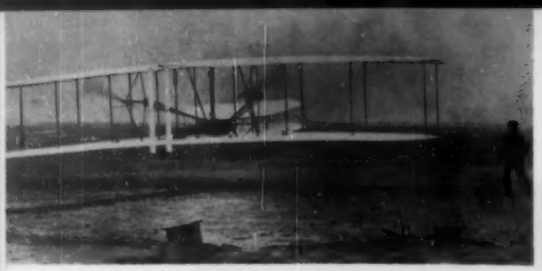
TYPE W.2. Standard Welding 180° U Bend with extra heavy outer wall to ensure longer life.

For Oil Refinery and Chemical Plant.
Made in Sheffield to the design of The Ohio Steel Foundry Co., U.S.A.

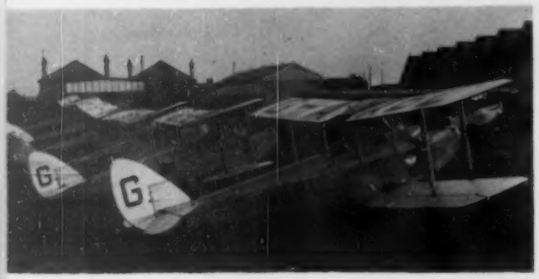
Return Bends are manufactured for all pipe sizes, any I.D. or wall thickness, from any type of cast steel, and on close centre dimensions.

OSBORN

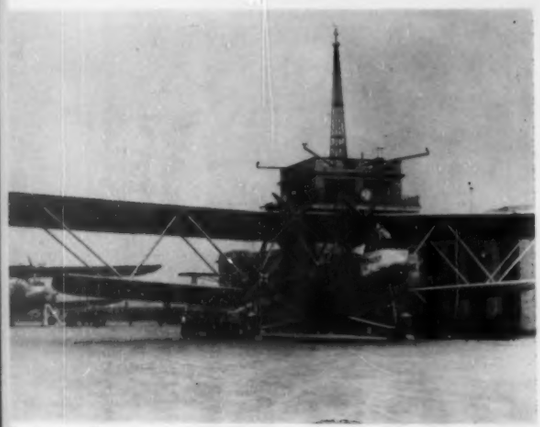
SAMUEL OSBORN & CO., LIMITED
CLYDE STEEL WORKS, SHEFFIELD, ENGLAND.



The first powered flight December 17, 1903 at Kitty Hawk, North Carolina. Photo courtesy Smithsonian Institution.



De Havilland Cirrus Moths at the London Aeroplane Club in the 1920's. The Moth was one of the first post-war civilian light aeroplanes.



Above, H. P. 42's at Croydon Airport, the first British 4-engined covered-cockpit airliner, the mainstay of Imperial Airways in the thirties. Below, Douglas DC-2 airliner owned by K. L. M. which came in second in the 1934 Melbourne air race with a full load of passengers and mail.

Below, a Meteor jet fighter refuelling in flight by the British "probe and drogue" system. The tanker aircraft trails a conically tipped hose, or drogue, while the refuelling pilot adjusts his speed to the tanker and jockeys his probe into the trailing drogue.

BRITISH OIL NEWS

By E. Lawson Lomax

In recognition of the fiftieth anniversary of man's conquest of the air, the Film Unit of Shell Petroleum Co., with the technical guidance of the Royal Aeronautical Society, has prepared a film record of the progress of the airplane and of events that have made aeronautical history since the pioneer flight of the Wright brothers at Kitty Hawk, North Carolina, on December 17, 1903. The record has been compiled almost entirely from original moving pictures of planes and of incidents connected with their development over the past half-century. It bears the appropriate title "Powered Flight" and received its first press showing last December.

The bulk of the material came from the film archives of Britain's War Office, Air Ministry and Central Office of Information, but the search for "missing links" included newsreel companies and official collections in the United States, France and Germany, as well as little known private collections, information about the latter being in the majority of cases supplied by Dr. A. M. Ballantyne, secretary of the Royal Aeronautical Society.

The picture story, harking back to the early days, impresses strongly upon the mind of an oil man the realization that the development of aerial flight has been a dual one, each forward step in the construction and operation of planes being attended by corresponding improvement in the quality and performance of the fuel that made their flight possible.

In the early years of the 20th century, the refining of petroleum was mainly carried out by trial and error, and little scientific knowledge was required or used by the refiner. To a great extent the same may be said of the early builders of aircraft.

The only standards the petroleum industry worked to were flash or fire point, viscosity, cold test, melting point of wax, color, gravity and distillation range, and the methods of carrying out these tests were not standardized but varied according to the ideas of processors. They were also governed by a variety of instruments, some of them of the crudest nature according to present standards.

Distillation in the industry was in the main intermittent, and carried out in large boiler stills of various shapes, sizes and dimensions with no fractionating devices. Probably the most progressive country in its refining methods at that time was Russia, in its refineries at Baku, where continuous distillation in benches of up to 40 boiler stills was in operation.

Gasoline or motor spirit was sold on gravity and little attention had been paid to boiling range. The advent of the internal combustion engine, the forerunner of aviation, pointed out the fact that other properties of gasoline apart from gravity had to be considered, of which the first to come into general use was distillation range.

Progress in refining technique was not very rapid prior to the first World War, but the war gave a great filip to both the aviation and the petroleum industry, as did the increasing use of the internal combustion engine. The first of these developments was the process of cracking, as it had become apparent that the known petroleum resources at that time were not sufficient to supply the required quantities of fuel for internal combustion through direct extraction of suitable fractions by straight distillation. While these processes became a palliative in the supply of gasoline for automobiles and similar types of engined vehicles, yet the use of cracked spirit was looked upon with suspicion for aerial navigation.

About the same time, the present practice of pipe-still and fractionation column distillation began to be developed, and the use of the old boiler-type still began to fall into the background, but even now it is not entirely obsolete for special purposes.

The two decades between the two world wars can be said to mark the greatest progress of both the aviation and the petroleum industry. Aeroplanes required fuel with the necessary properties and the petroleum industry laid itself out to provide it, the two industries progressing at about the same rate, with mutual advantage to both.

The internal combustion engine industry realized that with higher compression ratios, engines could be built to develop greater power per unit weight, but with these higher compression ratios fuels were required which under these conditions did not give pre-ignition or knocking and so the petroleum industry proceeded to develop processes to supply fuels enabling compression ratios to be raised from the normal 3-4:1 to as high as 15:1 and possibly the limit has not yet been reached.

It is interesting to note that, according to information published by the Society of British Aircraft Constructors, the ratio of horsepower to weight of the Wright's small engine was 12.6 pounds per hp. Ten years later the Rolls-Royce Eagle gave a quarter of the Wright's power/weight ratio. The Merlin's power/weight ratio was 0.90, and the turbo-prop Dart of today weighs only 0.68 pounds per hp.

The advent of the jet engine started a new phase in aviation fuels as the normal fuels for such engines are the products of petroleum lying in the kerosine distillation range.

Thus kerosine, which was the main product from petroleum in the early part of the century but used mainly for lighting and heat, has now found new usefulness for the generation of power for jet-engined aircraft.

Whether it will remain so is a matter for conjecture, as the successful use of heavy fuels in the gas turbine leads to the presumption that in the not too distant future, jet engines will be able to operate on a much heavier fuel than kerosine, and possibly a simply prepared crude oil will be the fuel of the future for jet engines.

European Manufacturers Organize

Announcement was made from Paris in December of the "Federation Europeene des Constructeurs de l'Equipment Petrolier" (European Federation of Petroleum Equipment Manufacturers).

Delegates representing Belgium, France, Germany, Italy, the Netherlands and the United Kingdom took part in the organization. All other member-countries of OEEC are invited to join.

Douglas Wilson, chairman of the Council of British Manufacturers of Petroleum Equipment, was unanimously elected president of FECEP. Maurice Poignon, the authorized delegate of the French Association of Equipment Suppliers of the Petroleum Industry, was appointed secretary. Temporary headquarters of the association are at 10 Avenue Hoch, Paris 8.

The Council of British Manufacturers of Petroleum Equipment, established over ten years ago, is putting its experience at the disposal of the new body in the person of Frank Kenyon, a member of its executive committee, as liaison officer.

The aims of the new association are stated as follows:

(1) Co-ordination of technical information to perfect the performance of a specialized European industry which will supply the needs and contribute to the development of petroleum equipment.

(2) To facilitate the task of existing and future bodies in each member country in making effective contribution to the growth of new technical developments for the petroleum industry on an all-European scale.

(3) To draw the attention of the highest authorities towards those special economic problems whose international solution seems indispensable to the development of the petroleum equipment industry.

(4) To make the world market fully aware of the possibilities and capacity of European producers in this industry.

"Klingerit"

COMPRESSED
ASBESTOS
SHEET PACKINGS

proved the best by the test of time

FIRST IN 1886 - - -
FOREMOST TODAY

Write for the Klinger Home Catalog which describes the complete range of Klinger products, comprising sheet packings for all purposes, valves, gaskets and pipes, rubber and allied products.

RICHARD KLINGER LIMITED, KLINGERIT WORKS, SIDCUP, KENT, ENGLAND

Manufacturing Licensees for Canada — Agents throughout the World — Manufacturing Licensees for U.S.A.

JOSEPH ROBB & COMPANY, LIMITED
5575, COTE ST. PAUL ROAD, MONTREAL, 29, CANADA
Telephone: WILBANK 3181 — Cables: ROBCO
Branches at: SYDNEY, N.S., HALIFAX, N.S., OTTAWA, Ont., TORONTO, Ont., HAMILTON, Ont., WINNIPEG, Man., EDMONTON, Alta., VANCOUVER, B.C.

THE KLINGER CORPORATION OF AMERICA
95, RIVER STREET, HOBOKEN, NEW JERSEY, U.S.A.
Telephone: HOBOKEN [illegible] — Cable: KLINGERAM
New York Office: 67, BATTERY PLACE, NEW YORK 4, N.Y., U.S.A.
Telephone: WHITEHALL [illegible] — Cable: COTTOMAT

Line Pipe for Canada and Alaska

Messrs. Stewarts and Lloyds Ltd. announce that they have received through Williams Bros., well-known American contractors, an order for several hundred miles of line pipe for the Haines-Fairbanks pipe project in British Columbia and Alaska.

The value of the order is approximately £1,000,000 and will be paid in dollars. It was secured in face of international competition. The pipe will be manufactured in the company's works at Glasgow, South Wales and the Midlands.

Personnel

W. C. Bell of Stewarts & Lloyds Ltd. has been awarded the American Iron and Steel Institute Medal for 1953 for a paper entitled "A Review of European Operating and Technical Practices" which he delivered in New York in May 1953.

The medal is awarded annually for a paper of special merit and importance to the American iron and steel industry. It was established in 1927 to perpetuate the memory of Elbert H. Gary, the first president of the Institute, and to stimulate improvements in the iron and steel industry. There are no restrictions regarding the nationality of the recipient, but this is the first occasion on which the medal has been given to anyone other than a citizen of the United States.

Esso Petroleum Company has appointed W. H. Critchlow to be general sales manager and E. F. Choppen to be assistant general sales manager.

Mr. Critchlow joined the company as a clerk in 1920 and became manager of the northern division in 1939. After service as manager of the Midland division and later of the London division, he was made assistant general sales manager in 1951, which position he held until his present appointment.

Mr. Choppen joined the company in 1930 as a chemist in the technical sales department. After serving with the Petroleum Board as a chemist at Avonmouth and Saltend, he was appointed superintendent of Saltend installation in 1946. In 1949 he was moved to Manchester and became manager of the company's northern division in 1953. Other appointments are B. A. Tunks to be manager, northern division, and E. W. Hardiman to be manager, southwestern division.

Anglo-Iranian Oil Co. announces the appointments of P. T. Cox as exploration manager and chief geologist, N. L. Falcon as manager of the company's geological division, and Dr. D. T. Germain-Jones as chief geophysicist.

Mr. Cox was general fields manager in Persia from 1948 to 1951 and has been exploration manager of D'Arcy Exploration Company for the past year and a half. He joined Anglo-Iranian in 1924 and has worked as a geologist in Peru, Venezuela, Colombia, Kuwait and Persia, as well as in the United Kingdom. During the late war he served with the Royal Engineers in the European theatre of operations and was awarded the MBE.

Mr. Falcon joined Anglo-Iranian in 1927. Until 1936 he served in Persia. He was resident geologist at Gach Saran when the field was discovered and took part in many of the reconnaissance geological surveys of the mountain belt in Luristan, Bakhtiaristan, Kuhgalu, Qashqai Sarbad and Persian Baluchistan. On his return to the United Kingdom he was resident geologist for the exploration drilling program in Scotland. During the war he reached the rank of Lieut. Colonel and was awarded the United States Bronze Star. Since the end of his war service in 1945 he has been located at Anglo-Iranian's head office with exploration in the United Kingdom and photo-geological work as his special responsibilities.

Like Mr. Falcon, Dr. Germain-Jones joined the company in 1927. In 1936 he led the party which located and outlined the Lali field in Persia and the following year was awarded his PhD (London) for a thesis on a geophysical problem in Persia.

During the war Dr. Germain-Jones led the seismic exploration party engaged in the search for oilfields in the United Kingdom. After another four years in Persia, he began the organization of the company's geophysical research and development section at Kirklington Hall, Notts., and remained there as senior research geophysicist until his transfer to London last June.

Helicopter Use in Western New Guinea

Nederlandsche Nieuw-Guinee Petroleum Maatschappij (NNGPM) in which Bataafsche Petroleum Maatschappij is a principal partner, has held a 38,000 square mile concession in the extreme northwest of the island of Netherlands (Western) New Guinea since the thirties. A small but steady annual production of about 250,000 tons of crude oil is now being shipped from the port and newly created industrial center of Sorong, situated on the northwest coast of the island, and further exploration work is being undertaken on a large scale to find new fields.

The ground being covered consists of thick swampy jungle with a heavy and almost incessant rainfall. These conditions are an almost insuperable obstacle to ordinary methods of transport, and three single-engined two-seater Bell 47D helicopters have been adopted for this purpose.

Despite their small size and a payload limited to 300 pounds for each machine, over 78 tons of supplies were carried during 50 machine days in a total of 974 separate flights and 182 flying hours.

Progress at Aden

It is just over a year since work on the site of the new Anglo-Iranian refinery at Little Aden was begun, but in that time it has been changed from a sandy waste to a scene of constructional activity. Most of the towers of the two distillation units have been erected, the SO_2 plant is half-completed, tank erection has started and the foundations of the power plant are nearly finished.

Accommodation for 2,500 British, American and European workers and 10,000 local laborers has been built, as well as recreation halls, an open-air cinema, a bakery, butchery, laundry and police and fire stations.

At the oil port, 2,500,000 cubic yards of sand have been dredged and pumped ashore in the reclamation area. Nearly 1,000,000 yards of rock have been quarried from the hills surrounding the site for construction of the breakwater which now extends 3,700 feet seaward, the ultimate length being 4,000 feet. Piling for the first of the three tanker jetties is well advanced.

Fortiweld—A New Steel

Research laboratories of United Steel Companies Ltd. have produced a new steel of great interest to the petroleum industry. In an endeavor to improve the steel used in power station steam pipes, experiments were made to determine the effects of a relatively little used element, boron, on the properties of low carbon molybdenum steel. W. E. Bardgett, research manager, discovered that where molybdenum and boron were present in certain proportions, the yield point of a low carbon steel was doubled without any necessity for heat treatment. As little as one ounce of boron, when added to a ton of 0.4 percent molybdenum steel, was sufficient to effect this pronounced improvement in strength.

In addition to these properties, it is capable of standing service stresses two to three times those permissible for mild steel. Its properties make it particularly attractive for highly-stressed welded structures whether at ordinary or elevated temperatures.

Sea Trials of "Safety" Tanker

The T.E.S. "Helix," built by Swan, Hunter & Wigham Richardson Ltd. to the design of the Anglo-Saxon Petroleum Co., was put through her official sea-trials on October 19. This vessel embodies many new features which have been specially adopted for safety reasons and quick turnaround at ports. She is powered by turbo-electric machinery driving a single screw giving an all year round speed of 14.5 knots. The four discharge pumps are turbo-driven vertical centrifugals with a combined discharge rate of 2,000 water tons per hour, all located in one pump house.

A special painting technique to combat external fouling and corrosion was employed. The hull was flame cleaned and the full number of coats of paint was applied before the vessel was launched, thus giving complete protection from the instant of entering the water.

The cargo heating coils are made of non-corrodible malleable cast iron with fins to increase the heating surface and to obviate the need for periodic renewal.

Pressurization is employed in the boiler room, in the all-electric galley, the crew's recreation room and other compartments. Mechanical ventilation is used with incoming air automatically tested for gas. If the gas content of air approaches danger point, boiler fires and naked lights are automatically extinguished. Pressure is maintained slightly above atmospheric.

An overside lift is used for hoisting ship's personnel and stores and eliminates the hazard of climbing companion ladders or gang ways at various angles. The lift is made of light aluminum alloy and has four wooden wheels which bear against the ship's side, a cable leading from the upper part of the car to the lift pulley. The load carried is six men or 10 cwt. of ship's stores.

Mobile Field Camp

Iraq Petroleum Co. Ltd., which has many "Supalite" houses erected at its various fields which have proved very satisfactory, has requested Maycrete Ltd. to provide a mobile camp house built on the same principle.

In conjunction with G. H. Burgess & Co., such a building (consisting of two bedrooms, living room, kitchen, bathroom and toilet and covering a total area of about 600 square feet) was designed which, when erected on a steel raft, is completely mobile and capable of being moved without dismantling.

The steel raft foundation is mounted on and integral with two longitudinal beams running along the outside edge of the raft, allowing the raft and building to be placed on any reasonably level site without requiring a permanent foundation. The raft is sectionally constructed to allow easy shipment and transportation. Arrangements are made at each corner for positioning four hydraulic jacks. These operate in two lifts and allow the whole structure, with a weight of 12 to 13 tons, to be raised to a height of approximately five feet six inches.

At a recent demonstration, a specially constructed trailer made by R. A. Dyson & Co., Liverpool, was backed under the raft which was lowered onto the trailer, secured by adjustable shackles and towed away to a new location where the reverse procedure was adopted. The trailer was towed by a six-wheel drive constructor tractor made by Scammell Lorries Ltd. of Watford.

W. C. Bell

W. H. Critchlow

P. T. Cox

N. L. Falcon

T. Germain-Jones

DU PONT REG. U.S. PAT. OFF.

PETROLEUM CHEMICALS DIVISION

NEWS

DU PONT REG. U.S. PAT. OFF.

February ★ One of a Series of Interest to the Petroleum Industry ★ 1954

DEALERS will be able to keep him sold on your brand of gasoline with the aid of this new Du Pont folder.

Giving a satisfactory answer to poor starting complaints is a tough proposition for the average dealer. To help him handle the situation in a salesmanlike way, this new 4-page folder will give him the answers he needs—in a short, clear-cut fashion that is easy to remember.

Ask your Du Pont Petroleum Chemicals Division representative for a sample copy and information on obtaining a quantity for your dealers.

New, Comprehensive Booklet on Antioxidant Sweetening Now Ready

Since antioxidant sweetening offers many cost reduction and quality advantages over other sweetening methods, many refiners have asked us for technical information on the subject.

To fill these requests, Du Pont has prepared a comprehensive booklet on antioxidant sweetening. It contains more information on this process than ever before published in a single volume.

Cost-Saving Data

The booklet gives information on how you can reduce operating and sweetening equipment costs through the use of Du Pont Antioxidant No. 22. It also shows how you can reduce loss in gasoline or octane number through the efficient use of the process . . . as well as sweeten and inhibit your product in a single step.

Helpful Hints

The booklet fully explains the variables encountered in antioxidant sweetening. Helpful hints on how to control these operational variables for best results are also included. These will help you save considerable time and money in getting the process started in your refinery.

This basic, authoritative text on antioxidant sweetening is yours for the asking. Address your request for "Antioxidant No. 22 Sweetening" to any of the Du Pont Petroleum Chemicals Division regional offices.

Du Pont Publishes New Book on Medical Aspects of Tetraethyl Lead Operations

The first and only book of its kind . . . produced as an aid to refinery medical personnel

There has long been a need for a book of specialized information on the medical aspects of tetraethyl lead handling. With this in mind, three of Du Pont's physicians who specialize in tetraethyl lead problems have collaborated in bringing out a volume which covers this subject in an authoritative and comprehensive manner. The title is, "Maintaining Hygiene in Tetraethyl Lead Operations."

CONCISE, LOGICALLY ORGANIZED and written in a direct, clear style, "Maintaining Hygiene in Tetraethyl Lead Operations" can be extremely helpful to refinery physicians in explaining lead hazards and precautions to refinery personnel.

In spite of the toxicity of tetraethyl lead, an enviable health and safety record has been established by the refinery workers who regularly come in contact with this chemical. The chief aim of the new book is to help the petroleum industry maintain this outstanding record.

Safety As A Way Of Life

The theme of the volume suggests that *preventive* medicine – rather than medical care – is the real core of a successful industrial medical program. Its chief emphasis is, therefore, on helping refinery doctors and safety personnel *prevent* accidents resulting from improper or careless handling of tetraethyl lead.

But to prepare the refinery medical staff for *any* emergency related to lead poisoning that may arise, the text also

ADVERTISEMENT—Prepared for the Petroleum Chemicals Division of E. I. du Pont de Nemours & Company (Inc.)

OVER

DU PONT

PETROLEUM CHEMICALS DIVISION
NEWS

DU PONT

CONTINUED *Medical Book*

includes specific data on the symptoms and treatment of poisoning from organic lead.

A Useful Reference

"Maintaining Hygiene in Tetraethyl Lead Operations" is a practical reference manual on a highly specialized field of industrial medicine.

Refinery doctors will find it extremely useful, for example, in setting up procedures for examining and advising workers in tetraethyl lead areas.

30 Years Experience

The Du Pont Company has been directly concerned with the manufacture and handling of tetraethyl lead for more than 30 years. It is from this experience – combined with constant, thorough study of the problems involved – that the authors of this book have drawn their material.

In addition to their work with employees in Du Pont's tetraethyl lead manufacturing area, the three authors of the book – Drs. Stewart L. Rankin, Lawrence A. Gerlach and Fenton Russell–have worked closely with refinery medical staffs on safe TEL handling procedures for many years.

THIS NEW Du Pont medical book is printed and bound, for durable use, between hard covers.

Limited Distribution

"Maintaining Hygiene in Tetraethyl Lead Operations" was written expressly for and addressed primarily to doctors in the petroleum industry to whom it will be distributed during the course of the year. A limited number of copies will also be distributed by Du Pont to oil company executives directly concerned with safety and medical procedures in the handling of tetraethyl lead.

Assistant Mid-Continent Regional Manager

DONALD W. FRISON, recently appointed assistant manager of the Petroleum Chemicals Division's Mid-Continent Region, has been with the Du Pont Company since 1947.

His first assignment with the company was as manager of the Mid-Continent District Laboratory. In 1951 he was transferred to the Wilmington office as technical assistant to the director of sales. He later became assistant manager of sales promotion and then assistant to the sales manager.

Before joining Du Pont, Mr. Frison was engaged in CFR engine work and refined petroleum products analysis at the Florida State Petroleum Laboratory. He graduated from the John B. Stetson University in Deland, Florida with a B.S. degree in chemistry.

During World War II, he was a petroleum officer in the U. S. Navy Bureau of Ships and was engaged in tanker loadings at the New York petroleum pool. Mr. Frison is a member of the Society of Automotive Engineers.

New Tank-Cleaning Safety Presentation Available to Refiners

Constant vigilance is *a must* for all perscnnel engaged in cleaning leaded gasoline storage tanks. But workers easily become bored–and sometimes careless –when safety rules and procedures are presented over and over again in the same old way.

To help overcome this situation, Du Pont has prepared a new, interest-arousing tank cleaning presentation. Our representatives first teach your own training staff how to use this tool– then leave it with you for use as you see fit. It is a penetrating, easy-to-understand training piece that your foremen can use with the tank cleaning crew for "tool box" safety meetings *on the site.*

Turn-Over Style

To make the presentation easy to handle and interesting to present, it has been put together in turn-over style. Copy of the talk and guides for the speaker are printed in large type on the back of each page. Pages facing the audience are illustrated either with colored cartoons or large sized photos of actual operations. All necessary safety precautions and procedures pertaining to the lead hazard are fully covered.

Distribution of the presentation will be limited to those responsible for the safety and training of tank cleaning crews. If you are interested in this important safety aid we suggest you get in touch with the nearest Du Pont Petroleum Chemicals Division regional office at once.

DU PONT
REG. U.S. PAT. OFF.
Better Things for Better Living
. . . through Chemistry

Petroleum Chemicals

E. I. DU PONT DE NEMOURS & COMPANY (INC.)
Petroleum Chemicals Division • Wilmington 98, Delaware

Regional Offices:
NEW YORK, N. Y.—1270 Ave. of the Americas . . Phone COlumbus 5-3620
CHICAGO, ILL.—8 So. Michigan Blvd. . . . . Phone RAndolph 6-8630
TULSA, OKLA.—1811 So. Baltimore Avenue . . . . . Phone Tulsa 5-5578
HOUSTON, TEXAS—705 Bank of Commerce Bldg. . . . . Phone PRestan 2857
LOS ANGELES, CALIF.—612 So. Flower St. . . . . Phone MAdison 1691

IN CANADA: Canadian Industries Limited—Toronto, Ont.—Montreal, Que.—Calgary, Alta.
OTHER COUNTRIES: Petroleum Chemicals Export—Nemours Bldg., 6539—Wilmington 98, Del.

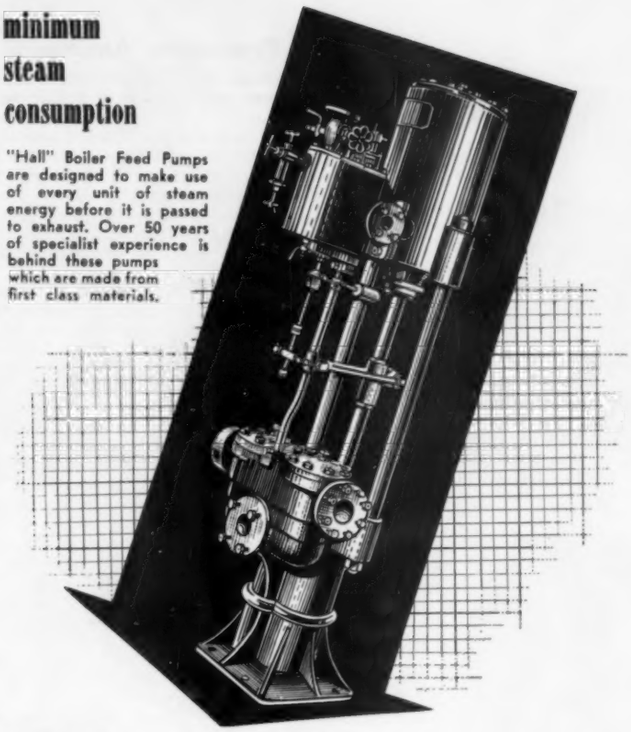
ADVERTISEMENT—Prepared for the Petroleum Chemicals Division of E. I. du Pont de Nemours & Company (Inc.)

A-6688

Printed in U.S.A.

minimum steam consumption

"Hall" Boiler Feed Pumps are designed to make use of every unit of steam energy before it is passed to exhaust. Over 50 years of specialist experience is behind these pumps which are made from first class materials.



HALL BOILER FEED PUMPS

Of the Vertical Single Cylinder Direct and Double Acting type, the standard range of Hall Pumps covers capacities from 250 to 10,000 gallons per hour.

J. P. HALL & SONS LTD PETERBOROUGH ENGLAND

P3834

HAVE YOU EVER BEEN IN A SPOT LIKE THIS?

If your shot hole drilling takes you off the beaten path, chances are you've witnessed a predicament like this, where the driver has said, "But for the grace of God and my KING Winch up front, I'd still be in there."

Day in, day out, around the world, wherever exploration goes on, KING Front-Mount Winch Assemblies are getting crews in and out of otherwise inaccessible locations . . . blizzard or flood, sand or mud, over bad roads or no roads at all.

The result of over 20 years of front-mount leadership, KING Winches are lightweight, properly balanced and ruggedly braced for years of heavy pulling.

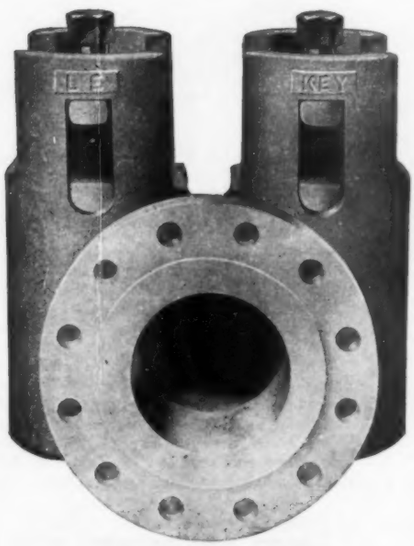
Whether crankshaft driven for 3-speed transmissions, or power-take-off driven for 4-speed transmissions, as above, KING Winches are "factory-fit" assemblies for all popular model trucks.

Write for bulletins on KING Complete Front-Mount Winch Assemblies to fit your trucks.

Koenig IRON WORKS

2214 Washington • Houston 10, Texas

FOR OIL REFINERY & CHEMICAL PLANTS



Two-hole Terminal Fitting with Flanged Side Outlet

MILLENNIUM KEY

Millennium—Key Cast Steel Fittings

FOR STRENGTH & PRESSURE TIGHTNESS

These four bulletins give full technical information on each type of fitting we can supply. Please write for them

Lake & Elliot Ltd.

BRAINTREE ENGLAND

L4680D

INTERNATIONAL NEWS AND NOTES

Italy Planning for World Congress

The Italian General Organizing Committee for the Fourth World Petroleum Congress and the various special committees which have been set up in prevision of the work to be carried on in advance of its assemblage in June 1955 have been very active during the last few months.

The general committee moved its secretarial office from the temporary location at Unione Petrolifera, Rome, to the permanent seat at 20, Via Tevere, Rome. Meanwhile the special committees have been active in the different fields assigned to each. The financial committee has prepared a complete budget of the foreseen income and expenses and has started the collection of funds among the Italian industries.

The technical committee has provided for the translation into one of the official languages (English and French) of the proposed titles and summaries of the Italian papers. Lists containing titles and summaries of the papers proposed by 18 national committees of various countries have been prepared and classified under the Congress' sections and general subjects or topics. The lists, in both the official languages, accompanied by explanatory tables on the number of papers proposed, classified by nation, section, and topic, have been circulated among the members of the permanent council and among the national committees. The members of the permanent council, which met in Rome on January 19, will work on the lists to select the papers to be accepted for presentation before the Congress. A limited number of papers (150) has been decided upon. About 270 summaries have been submitted, and almost every national committee has sent in a number of summaries of papers higher than that assigned by the council.

The logistical committee has been examining the possibilities of Rome and of Venice as the seat for the Congress. The final decision has not yet been made, but it is probable that the choice will fall on Rome. Plenary and session meetings could be held (if Rome is selected) either at the FAO (U. N. Food and Agriculture Organization) building, or at the EUR-53, the Exposition Center of Rome, where monumental buildings with large meeting facilities have been erected during the past ten years. The editorial committee is considering the matter of publication of preprints to be circulated in advance among participants in the Congress, and of the proceedings. Both works present difficulties, particularly in connection with the necessity of printing and correcting hundreds of highly technical papers written in a number of languages.

To Build Canadian Cracker

The Fluor Corp. of Canada Ltd., Toronto, Ont., has been awarded a contract for the design and engineering, material procurement and construction of a Model IV fluid catalytic cracking unit to be built for the Standard Oil Co. of British Columbia Ltd. at its Vancouver, British Columbia refinery.

The unit will have a fresh feed capacity of 3,750 barrels per day. Engineering work will get under way immediately and Fluor will begin actual construction of the new unit in March 1954. Completion of the project is scheduled by October 1, 1954.

Oil Tests in Nigeria

Testing of the Akata well of the Shell D'Arcy Petroleum Development Co. of Nigeria has confirmed the presence of oil in small quantities associated with a considerable volume of gas. Although this result is encouraging, tests so far have not established the presence of oil in commercial quantities. Further testing is in progress.

Heads Canadian GSI

Charles M. Moore, Jr., vice president and manager of Geophysical Service International Corp., Calgary, Alberta, has been elected president of the company. F. J. Agnich, former president, was made chairman. The Canadian geophysical company is an affiliate of Geophysical Service Inc., 5900 Lemmon Ave., Dallas.

Mr. Moore joined the staff of GSI in 1934 and has served as party chief, supervisor, and as division manager of the GSI Canadian division. With formation of Geophysical Service International Corporation in 1952, he was appointed vice president and manager. He has resided in Canada since 1946.

C. M. Moore, Jr.

Iranian Oil Negotiations

Optimistic reports have come from Teheran and London during the past few weeks as to the possibility of a reasonably prompt agreement between the British and Iranian governments that will permit a resumption of operation by the Persian oil industry. Diplomatic relations have been resumed and both governments have expressed their desire for a mutually satisfactory agreement.

Gen. Zahedi's government, faced by early exhaustion of the temporary financial aid extended by the United States several months ago, is anxious to get oil moving and has indicated that it will welcome the assistance of foreign technicians to accomplish this, but there are numerous organizational questions of the basis of recompense to the Anglo-Iranian Oil Co. to be settled before a durable program can be installed. Meanwhile, the possibility of a loan to Iran against existing stocks is being canvassed.

Much speculation was caused by the meeting in London of representatives of the larger international companies, but this was explained as confined to informal discussion of the quantities of Iranian oil that could be absorbed and the means of its distribution in the event that agreement could be reached on the main issue.

Interprovincial Pipe Line Enlargement

Additional capacity for the Interprovincial Pipe Line's movement of Alberta oil to eastern Canada is to be provided by looping the section of the line between Edmonton and Superior, Wisconsin, according to a statement issued by T. S. Johnston, president of the company, from his office in Toronto. The enlargement will require the laying of approximately 600 miles of 24 and 26 inch pipe between the two points. Nine pumping stations will be added—five in Canada and four in the United States.

Creole Promotions Announced

Creole Petroleum Corp. has announced a number of promotions and transfers of key personnel in Venezuela.

William J. Barnett has been named second assistant manager of the production department at Caracas. He was formerly head of the pipe line section, production department at Caracas.

Stephen P. Bredin was appointed industrial relations supervisor of the Caracas district. He formerly was acting industrial relations manager at Amuay.

Herbert Bernard Hegglund became assistant division manager at Maracaibo, a promotion from acting assistant division manager, Maracaibo.

Hubert J. Polk, administrative assistant in the production department at Caracas, was formerly district superintendent at Caripito.

John E. Andrews, manager of comptroller's department, Caracas, was formerly assistant manager of the accounting department.

Manuel Rafael Angulo, assistant manager corporate advisory department, Caracas, was formerly head of the commercial affairs section, legal department, Caracas.

Nicholas J. Campbell, Jr., manager of corporate advisory department, Caracas, was formerly assistant manager legal department, Caracas.

Ezra W. Drake, senior drilling administrator, Tia Juana, was formerly division petroleum engineer, Maracaibo.

Dr. Carlos Lander, compensation and benefits supervisor, Caracas, was formerly industrial relations administrator, Caracas.

Samuel J. Mathis, assistant district superintendent, La Salina, was formerly division general engineer Caripito.

Robert E. Mays, assistant manager comptroller's department, was formerly coordinator of comptometer functions in the Caracas accounting department.

John M. Pinkerton, district superintendent, Quiriquire, was formerly district superintendent, Caripito.

Robert L. Stephenson, division petroleum engineer, Maracaibo, was formerly petroleum engineer in production department, Caracas.

Dr. Siro Vazquez, director and manager of production department, Caracas, was formerly manager of production department, Caracas.

Henry E. Winter, division manager, Maracaibo, was formerly manager of the economic department, Caracas.

Edward E. Peake, former assistant manager of the production department, Caracas, has retired.

Shell to Enlarge Gas Plant

Following the successful completion of additional wells at Jumping Pound, Alberta, W. M. V. Ash, president of Shell Oil Company of Canada, has announced the second expansion within two years at Shell's Jumping Pound gas processing plant 20 miles west of Calgary. The new extensions will increase handling capacity to 70 million cubic feet per day, almost tripling the original plant capacity of 25 mmcf.

Contract for the plant expansion has been awarded to Refinery Engineering Ltd. of Toronto. Increased quantities of gas will be available for the 1954/55 winter season to Western Natural Gas Co. which supplies gas to Calgary, Banff, and other communities in Southern Alberta for domestic heating and industrial use.

Ebano Amalgamated with Esso

At the general meetings recently held by Esso A. G. and Ebano Raffinerie A. G. in Germany, it was decided to amalgamate both companies, i.e., to include Ebano in Esso A. G. Esso will issue new shares at a value of 20 million DM, thereby increasing its capital from 117 to 137 million DM.

Ebano has been operated as a part of Esso but as a legally independent company, producing finished products from crude in its works at Harburg and Bremen. Its capacity is at present 13,000 b/d. After the completion of the extensive enlargements and the erection of a modern catalytic cracking plant, the refinery will increase its capacity to 36,000 b/d.

On stream in seven countries

FROM ANGLO-IRANIAN REFINERIES in Great Britain and Australia, Italy and Israel, Germany, France and Belgium, a constant flow of BP petroleum products feeds the markets of the world.

At Aden, and at Fremantle in Western Australia, two more great BP refineries are being built. In Britain, the Company's refining capacity is already fourteen times the pre-war total.

This is progress indeed—of a sort that keeps Anglo-Iranian in the forefront of every branch of the world petroleum industry.

THE BP SHIELD IS THE SYMBOL OF THE WORLD-WIDE ORGANISATION OF

Anglo-Iranian Oil Company

LIMITED

REPRESENTATIVE IN U.S.A.: A. E. C. DRAKE 610 FIFTH AVENUE, NEW YORK 20, N.Y.

Australian Company Increases Capital

Sir Norman Mighell, chairman of Consolidated Zinc Pty. Ltd., has announced in Melbourne that the Frome-Broken Hill Co. Pty. Ltd., formed in 1946 to explore for oil and gas in Australia, will increase its capital to £A1,000,000 in order to intensify the search.

Shareholders of the company are D'Arcy Exploration Co. Ltd. (a subsidiary of Anglo-Iranian Oil Co. Ltd.), The Zinc Corp. Ltd., one of Australia's largest mining companies, and Vacuum Oil Co. Pty. Ltd. (a subsidiary of the Standard Vacuum Oil Co.).

During the seven years since the company was formed, extensive geological and geophysical work has been carried out over wide areas in Victoria, South Australia, Western Australia and the Northern Territory and a large amount of geological information has been accumulated.

Abandons Pakistan Test

Pakistan Petroleum Ltd. has abandoned test drilling for oil at Patiya in the Chittagong Hill Tracts of East Pakistan. The well was drilled to 10,176 feet with no showing of oil or gas. Despite failures at Patharia and Patiya, the company is going ahead with its plans to survey all probable oil-bearing areas of East Pakistan. A gravimeter survey has already been completed and a more detailed seismic survey of a part of this area near Sylhet is under way.

Dr. Haase Successor to Heiermann

Dr. Walther Haase, formerly commercial manager of DEA-Erdoelwerke, Holstein, Germany, became manager of Zweignierderlassung Erdoel und Bohrverwaltung der Preussischen Bergwerks- und Huetten-Aktiengesellschaft in Hannover on January 1 as successor to the late Bergassessor A.D. Heiermann.

Middle East Production

Crude oil production in the Middle East for November 1953 is reported as follows:

	PRODUCTION FIGURES NOV. 1953 LONG TONS	CURRENT TOTAL 1953 LONG TONS
Iraq Petroleum Co.		
Kirkuk field	1,914,057	20,890,886
Basrah Petroleum Co.		
Zubair field	256,447	2,770,479
Mosul Petroleum Co.		
Ain Zalah field	83,137	1,174,910
Qatar Petroleum Co. Ltd.	265,751	3,654,775
Kuwait Oil Co. Ltd.	3,360,835	38,620,002
Aramco	3,290,902	(24,342,677 US Bbl.)

Services Pumps in Indonesia

Ernest Wilhelm, Pacific Pumps service engineer, flew to Palambang, Indonesia, recently to repair two high pressure centrifugal pumps which have been in operation for 20 years in the Sungai-Gerong Refinery at Palambang, handling approximately 20,000 barrels of crude a day.

Oil Search in England

Drilling has started on a second test at Plungar, near Nottingham, where the D'Arcy Exploration Co. recently found small quantities of petroleum in its first well.

The second well, Plungar No. 2, is 1,000 feet away from well No. 1. The site was chosen after seismic surveys had been made in the area. The well has reached a depth of over 1,900 feet.

No. 1 well produced a quantity of oil at about 2,820 feet. Drilling was continued in the hope that more oil would be found at lower depth, but after tests showed the presence of water oil, the well was completed at 3,095 feet. Pumping equipment is working at a rate of 4-5 tons per day.

Royalite Purchases Refinery Operators

Royalite Products Ltd., a wholly-owned subsidiary of Royalite Oil Company Ltd. of Calgary, has purchased the physical assets of Refinery Operators Ltd., consisting of a 5,000-barrel topping plant at Coleville.

John Wach, formerly operations superintendent at the British American Oil Company Ltd. refinery at Montreal East, has been appointed superintendent of the Royalite 5,000-barrel refinery now under construction at Kamloops, B. C.

Construction work on the Kamloops refinery is proceeding on schedule with the tank farm, cooling towers, boilers and considerable pipe line already completed. The 12-inch take-off line from the Trans Mountain line to the refinery storage will be completed shortly and crude oil will be taken into the two 80,000-barrel tanks toward the end of January. The crude distillation unit will be ready for testing early in February.

Sarnia Plant on Stream

Sun Oil Company Limited's 15,000 b/d new Sarnia refinery is now on stream. Now in operation is a new type combination topping and Houdriflow catalytic cracking unit, the latter with a rated capacity of 11,000 barrels a day. A Houdry catalytic reformer is under construction with completion scheduled for February next year.

The Sun refinery equipment includes the most advanced type of system for the purification of waste water to avoid pollution of the St. Clair River. This system includes a bacterial oxidation installation for the removal of phenol or other organic waste material.

Gordon R. Henderson, a native of Canada and former chief engineer of the Polymer Corporation at Sarnia, is manager of the new refinery. Frank W. Bowen, formerly with Sun's Toledo refinery, is superintendent, and Fred A. Bain is chief refiner.

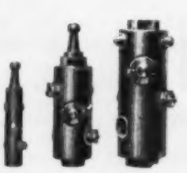
Descale WITHOUT Danger

The Air Motor "Skatoskalo" Set enables the operators to descale and clean tubes in the shortest possible time with the greatest efficiency. The air motor gives more horse-power and does not stall when heavy deposit is encountered.

The Air Motor Driven Set incorporates all the advantages of a Rotary Air Tool without sacrificing the advantages of the electrically-driven Flexible Drive type.

"Skatoskalo" equipment can be used with complete safety and is recommended for the efficient maintenance of cracking plant, boilers, evaporators, condensers, heat exchangers, etc.

Tubes of 5/8" internal dia. upwards can be thoroughly cleaned by "Skatoskalo" Air Tools.



Skatoskalo pneumatic tools deliver 9,000 blows a minute. Other types for surface scaling.

The "SKATOSKALO" Single Speed Air-Driven Descaling Machine

Flexible Drives (Gilmans) LTD.

INCORPORATING P. GILMAN (B.S.T.) LTD.

Representatives in all parts of the United Kingdom. Principal agents in over sixty countries throughout the world.

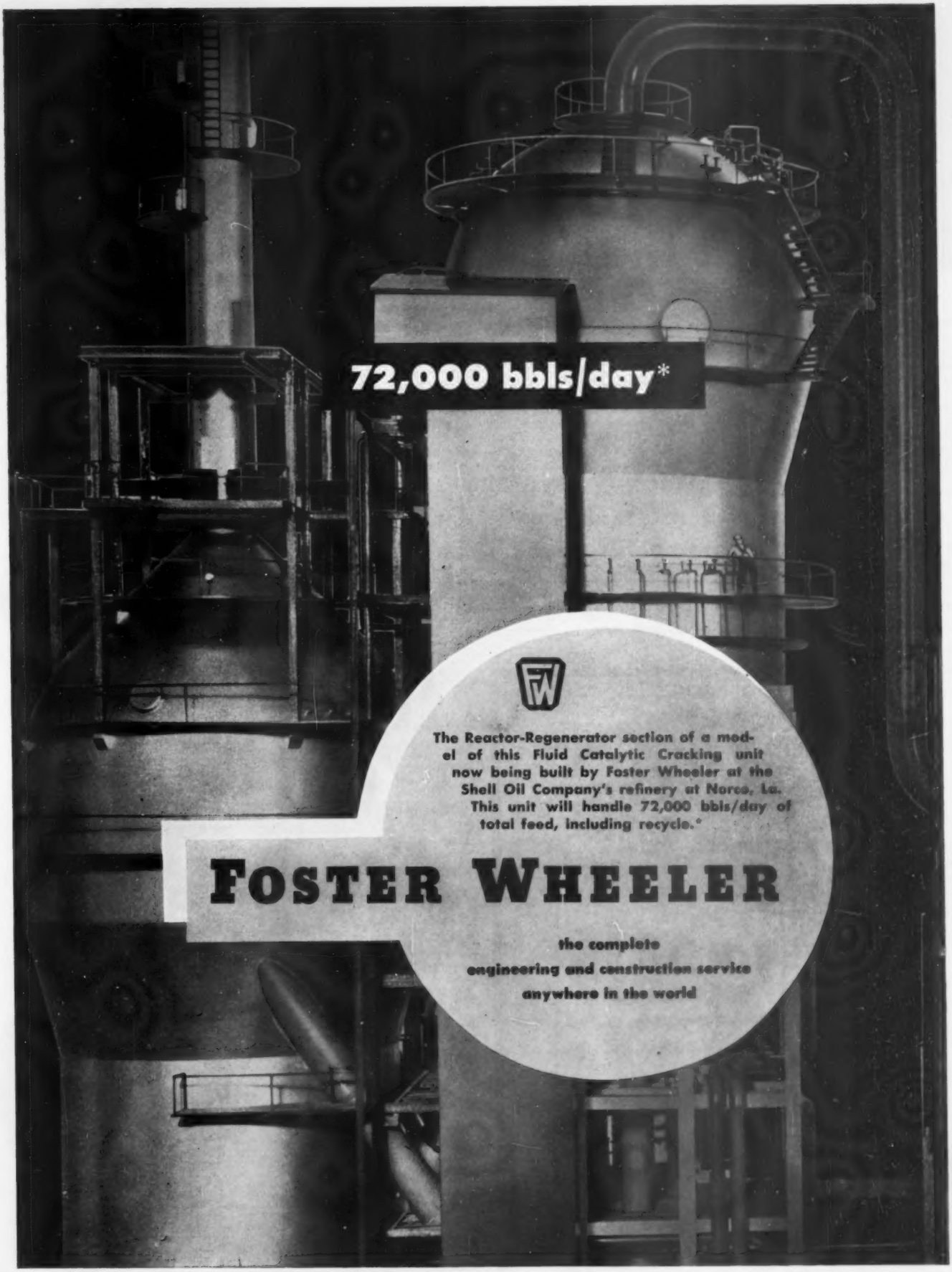
A Type T.E. tube scaling head "bites" into scale at 5 different levels as it progresses through a 2" tube.

Use SKATOSKALO

Write for Catalogue WP or contact our nearest Agent.

195 HIGH STREET, SMETHWICK 41, STAFFORDSHIRE, ENGLAND

Cables: Skatoskalo, Birmingham
Code: Bentleys



The Reactor-Regenerator section of a model of this Fluid Catalytic Cracking unit now being built by Foster Wheeler at the Shell Oil Company's refinery at Norco, La. This unit will handle 72,000 bbls/day of total feed, including recycle.*

FOSTER WHEELER

the complete
engineering and construction service
anywhere in the world

Dr. W. J. Sparks

FRANK M. DAWSON, who has been with The Texas Co. and associated companies for the past 25 years, has been named manager of the purchasing department effective January 1. Since 1946 Mr. Dawson has been vice president and later executive vice president and director of Carthage-Hydrocol, Inc.

He began his service with The Texas Co. as a chemist at the Port Arthur works in 1928. In 1939 he was transferred to New York as assistant to the vice president in charge of refining. In 1942 he became superintendent of the refinery of an associated company in Buenos Aires, Argentina. In 1945 he was named superintendent of the Lawrenceville works.

DR. R. G. GETTELL, formerly chief economist at Time, Inc., has been appointed foreign economist in the economics department of The Texas Co. Dr. Gettell has been a faculty member at Columbia, Harvard, Yale and Wellesley.

DR. WILLIAM J. SPARKS, co-inventor of butyl synthetic rubber, has been selected to receive the 1954 gold medal of The American Institute of Chemists. Dr. Sparks is director of the chemical division and coordinator of exploratory research for the Standard Oil Development Company. The medal will be presented at the Institute's annual meeting at Asbury Park, New Jersey in May.

The development of butyl rubber, the isobutylene-isoprene low temperature copolymer, introduced to the American chemical industry a radical departure in commercial operations, a continuous polymerization conducted at —110°F in large-scale equipment.

Among the other polymers of note which Dr. Sparks pioneered in the late 30's were "T-132," a high-styrene-isoprene emulsion copolymer, a forerunner of the artificial leather and shoe-sole type resins of present importance. Another was a thermoplastic film-forming copolymer of isobutylene and styrene of low temperature origin known as "S-Resin." This is considered to offer significant practical promise and is now in the semi-commercial stage.

SAM H. CASEY, general manager of purchases of Pan-Am Southern Corp., has been appointed manager of supply and transportation, reporting to R. L. Aycock, vice president. Mr. Aycock and Mr. Casey both serve as directors. L. F. Andry, formerly assistant traffic manager, became traffic manager, reporting to J. E. Monroe, general traffic manager. The reorganization will consolidate traffic, crude oil supply, product supply and exchange, purchasing and aviation under the supply and transportation department.

H. W. JONES, manager of industrial relations of The Atlantic Refining Co., has been elected a vice president. He started with Atlantic in 1926 as a chemical engineer and was named manager of industrial relations in 1935. During World War II he served as regional director of the training within industry service.

W. G. Thomson

W. G. THOMSON, manager of the Texaco Exploration Co. since March 1, 1952, has been appointed vice president and manager effective January 1. Mr. Thomson joined McColl-Frontenac Oil Co. Ltd. in 1931. From 1939 to 1946 he was with the Antilles Petroleum Co. in Trinidad, B.W.I. He was transferred to Calgary in 1946 to McColl-Frontenac's exploration division, and on January 1, 1951 he joined the newly-organized Texaco Exploration Co.

SAMUEL MESSER has been elected chairman of Quaker State Oil Refining Corp. to succeed the late Harry J. Crawford. Mr. Messer has been with the company for more than a half-century, serving as vice-president, president and vice-chairman of the board.

ARTHUR P. ALLISON, district geologist for Sun Oil Co. at Shreveport, La., has retired after 23 years of service. He has been in Shreveport since November 1947, when he opened a district geological office for Sun.

Operating *all-size*

ROTARY RIGS

in **TEXAS** *and*

NEW MEXICO

R. (Cotton) Makin
Residence phone **3-5968**
Office phone **3-3141**
Petroleum Building

MAKIN *Drilling Company*

P. O. BOX 1628 HOBBS, NEW MEXICO

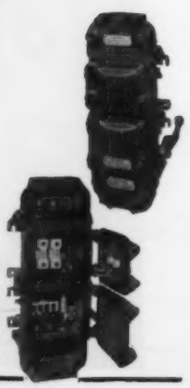
Typical flameproof distribution board.

G.E.C. Flameproof

SWITCH FUSES & SWITCH BOARDS

To B.S. 229 & B.S. 861

For controlling power and lighting circuits where flameproof gear is necessary in positions such as Mines, Petroleum Refineries and similar installations. The units have a maximum capacity of 100 amps. 660v. and are readily adaptable to individual requirements, each component being housed in a separate cast iron flameproof enclosure. Approved for groups I, II and III gases by Buxton Certificates.



600 v. switch fuse unit with terminal box.

THE GENERAL ELECTRIC CO. LTD., MAGNET HOUSE, KINGSWAY, LONDON, W.C.2

PROVEN SAFE, ECONOMICAL,
DEPENDABLE IN USE!
USED ALL OVER THE WORLD

EXPORT DIVISION
GENERAL AMERICAN
TRADE MARK

wiggins floating roofs

By GENERAL AMERICAN

The Wiggins roof floats on the surface of a stored product and the triple seal protection turns practically all pumping and standing losses into savings. Simple design keeps maintenance low. Tested and approved under all weather conditions.

Only the Wiggins Floating Roof has all the specifications which 30 years' experience has proven necessary for best performance.

GENERAL AMERICAN
TRANSPORTATION CORPORATION
Export Division: 380 Madison Avenue, New York 17, New York

Write to Export Division for full information and the name of your nearest representative.

LICENSEES

Etablts. Delattre & Frouard Reunis
39, Rue de la Bienfaisance
Paris, France

Societa Italiana Ernesto Breda
Via Bordoni 9-Casella Postale 3590
Milan, Italy

A. E. Goodwin Ltd.
47 Forsyth Street, Glebe
Sydney, Australia

Sanson Vasconcellos
Comercio e Industria de Ferro S.A.
Rua Frei Caneca, 47/49
Rio de Janeiro, Brazil

Tsukishima Kikai Co. Ltd.
9, 5-chome, Tsukishima-dori, Chuo-Ku
Tokyo, Japan

Toronto Iron Works Ltd.
629 Eastern Avenue
Toronto, Ontario, Canada

Jersey Standard to Divide Economics Department Functions

In recognition of the increasing importance and magnitude of the work now performed by its coordination and economics department, Standard Oil Co. (N.J.) has announced the establishment of two separate departments, effective March 1, 1954. One, to be known as the coordination and petroleum economics department, will be directed by J. A. Cogan. The other, to be the general economics department, will be headed by C. L. Burrill, who is resigning as a vice president of Creole Petroleum Corp., a Jersey affiliate, about March 1.

The coordination and petroleum economics department will conduct world-wide supply and demand surveys, prepare special studies and economic analysis of petroleum problems, and assemble statistics.

The general economics department will follow and analyze trends in general business and economic conditions on a world-wide basis. The department also will serve in an advisory capacity on general economic matters for Jersey and affiliated companies.

Platte Pipe Line to Increase Capacity

Construction will be commenced at once on two additional main line pumping stations to increase the capacity of Platte Pipe Line to 145,000 barrels per day. New stations are to be similar to the four main line stations now operating on the pipe line. Electronic instrumentation and controls are to be used and provision will be made for remote control of the stations from the Kansas City office.

Plans Ultraformer

Standard Oil Co. of Indiana plans to add a new 3,750 b/d catalytic Ultraforming unit to its refining facilities at Casper. The Lummus Company has been selected as prime contractor and is expected to begin construction in the late spring of 1954.

Bowman Joins Parsons

Thomas P. Bowman has joined The Ralph M. Parsons Co. as an assistant to Harry P. Broom, vice president in charge of Parsons' New York office. For the past eight years, Mr. Bowman was associated with Foster Wheeler Corp. as a project engineer on oil refinery and chemical plant work.

LPGas Sales Increase

Sales of liquefied petroleum gas increased nearly 10 percent in 1953 to 4,920,000,000 gallons, an increase of almost 443,000,000 gallons, and nearly double the gallonage increase registered during the preceding year, according to estimates by George R. Benz and Paul W. Tucker of Phillips Petroleum Company. Domestic and motor fuel rose 295,000,000 gallons or 11.2 percent; industrial and miscellaneous declined nearly 3 percent; and gas manufacturing or utility use dropped 5 percent. Chemical use registered the largest increase by a gain of 16.6 percent and synthetic rubber use gained 7.5 percent.

Engineer Wins Westinghouse Honor

Merritt A. Hyde, who has played a major role in the development and application of oil pipe line electrification, has been awarded the Westinghouse Order of Merit. Mr. Hyde is Westinghouse advisory engineer on mining, petroleum and chemicals and was active in the electrification of the well-known "Big Inch" and "Little Big Inch" pipe lines.

Petrocarbon to Build Houdriformer

Petrocarbon Chemicals, Inc., will build a 1,000 b/d Houdriformer at its Irving plant located near Dallas, Texas. The new reformer is designed for a considerable degree of flexibility required for its projected use in petrochemical service and high octane fuels. Tears Engineers of Dallas, Texas, will handle the engineering and construction of the Houdriformer, with completion scheduled for mid-1954.

T. P. Bowman

M. A. Hyde

RICHARDS

SPECIAL PURPOSE

Nuts, Bolts and all-thread Studs from special creep-resisting alloy steel, supplied in fully heat-treated condition within the 55-65 ton tensile range.

Studs are B.S.970/1947 EN19A (comparable to American ASTM 193-4 (†) Class B7 and B.S.S.1750-1951.

Nuts are Hot Forged and can be supplied to full Whitworth or American Heavy Standard sizes and heat-treated to ASTM 194-46 Class 2 or 2H and B.S.S.1750-1951.

Studs and nuts screwed to Unified, American, British Standard Whitworth Thread and British Standard Fine Thread, according to customers requirements.

CHARLES RICHARDS & SONS LTD., DARLASTON, near WEDNESBURY.

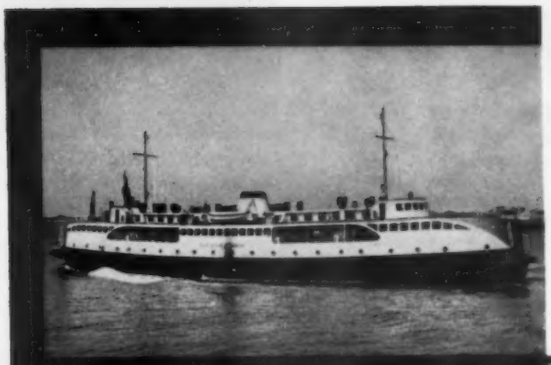
BOOKS

FIELD GEOLOGY, 5th Edition—Frederick H. Lahee	$ 8.50
FUNDAMENTALS OF THE PETROLEUM INDUSTRY—Dorsey Hager	$ 7.00
GAS ENGINEERS' HANDBOOK—Gas Engrs. Handbook Committee	$12.00
HANDBOOK BUTANE PROPANE GASES—Butane Propane News	$ 7.50
IGNEOUS AND METAMORPHIC PETROLOGY—Turner and Verhoogen	$ 9.00
INDUSTRIAL PIPING—Charles T. Littleton	$ 9.00
INTRODUCTION TO GEOPHYSICAL PROSPECTING—M. D. Dobrin	$ 7.50
LIQUID EXTRACTION—Robert E. Treybal	$ 8.00
LIQUID FUELS—Harold Moore	$ 7.75
MAGIC OIL SERVANT OF THE WORLD—A. M. Leeston	$ 3.75
MARINE GEOLOGY—P. H. Kuenen	$ 8.00
METALWORKING LUBRICANTS—E. L. H. Bastian	$ 6.50
MATERIALS ENGINEERING OF METAL PRODUCTS—Norman E. Woldman	$11.00
NATURAL GAS & NATURAL GASOLINE—Huntington	$ 8.00
OIL FIELD EXPLORATION AND DEVELOPMENT—A. Beeby Thompson, Vols. I & II (in sets only)	$23.50
OIL PROPERTY VALUATION—P. Paine	$ 4.50
OIL RECORD—PETROLEUM INDUSTRY PROJECTS	$ 6.00
OUR OIL RESOURCES—L. M. Fanning	$ 6.00
PETROLEUM GEOLOGY—R. M. Landes	$10.00
POLYMERIZATION OF ACETYLENE—Karl Kameyer	$17.50
PETROLEUM REGISTER (International Petroleum Register) 31st Edition, 1954	$15.00

TO ORDER, WRITE TO:

BOOK DEPT. WORLD PETROLEUM

604 FIFTH AVE., NEW YORK 20, N. Y.



HOLLAND—Typical of Holland's modern transportation facilities is the "Koningin Juliana." This palatial Diesel-powered ferry carries 75 automobiles and trucks and 2,000 passengers between the islands of Zeeland province. The "Koningin Juliana" is lubricated exclusively with Caltex products. Caltex is proud of its share in such advances in the transportation system of this historic land.

INDONESIA—Exploring and drilling for oil in the Minas field, Caltex employs mostly nationals, a Caltex policy in all lands. Natives—like this surveyor's helper—are trained in the many skills required by the oil industry, all of which give higher income opportunities. The Republic of Indonesia benefits through development of its resources, producing new government revenues.

SOUTH AFRICA—Fabulous land of gold and diamonds, South Africa is experiencing vigorous growth and modernization. Here in the shadow of the famous "Table Mountain" is the warehouse area of the Caltex Cape Town terminal—storage place for the fine fuels and lubricants for increasing numbers of motorists who "Travel the Caltex Way."

Caltex serves the people of 67 lands

In 67 lands, across half the world, through such developments as these, Caltex is able to supply better fuels and lubricants for industry, for agriculture, and for motoring millions. These require a continual investment of funds and skills, backed by a faith in a better future for free nations.

CALTEX Petroleum Products

SERVING EUROPE • AFRICA • ASIA • AUSTRALASIA

Wet Gas Aids Water Flood

New experiments in the Bradford oil field with water-flooding after injection of "wet gas" have shown startling results, A. E. Booth told a recent joint meeting of the Engineers' Society of Western Pennsylvania and the Pennsylvania Grade Crude Oil Association. Ultimate oil recovery from one experimental property may be twice the amount originally estimated, he said.

The injection experiment was made on a Kendall Refining Co. property covering almost 65 acres. Gas, consisting of 10 percent lease gas and 90 percent methane purchased from a gas company, was injected in various wells over three months at pressure up to 460 pounds.

Core engineers had estimated total recovery from the property over a 10-year period of 420,000 barrels, or 6,480 barrels per acre. The water flood was started November 29, 1952. At the end of three and one-half months, oil production was 1,352 barrels per day, Booth said.

At the end of nine months' operation, the property had produced 278,150 barrels of oil, or 4,290 barrels per acre, he went on. Gravity of the oil is high—47 to 48 degrees API. At this rate, he said, ultimate recovery is a matter of conjecture, but it may double the first estimates.

The "wet gas" process, he explained, succeeds in dissolving gas in the oil left behind by conventional secondary recovery methods and aids in the recovery of this residual oil, estimated to amount to 40 to 50 percent of the original oil content of the formation.

Cooper-Bessemer Expands at Odessa

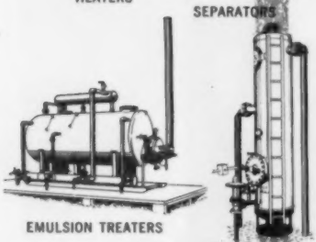
Expanded field service facilities are housed in a new building constructed by Cooper-Bessemer at Odessa, Texas, under the direction of A. W. Abel, branch manager. Serving the warehouse facilities is a two-ton traveling crane for expediting delivery of heavy engine and compressor parts to the Texas area.

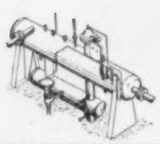
EFFICIENCY
B S & B
RELIABILITY

Wherever Oil & Gas Are Produced...

HEATERS

SEPARATORS


EMULSION TREATERS


FREE WATER KNOCKOUTS

STABILIZERS

CLIMAX CONTROLS

SAFETY HEADS

You'll Find BS&B Ready To Serve You!

During the more than 60 years that the petroleum industry has been developing into its present world-wide importance, BS&B has been serving it by anticipating the constantly changing problems and needs of the industry... and by producing the world's finest oil and gas field processing and storage equipment to meet them. If you have an equipment problem, why not talk it over with your BS&B Man? He'll gladly analyze it and recommend the best solution for you. Or write to us direct... there's no obligation!

From BS&B for the Petroleum Industry

Oil and gas separators... welded steel tanks... wood tanks... free water knockouts... low temperature separation units... gas dehydrators... stabilizers... heaters... gas desulfurizers... chemical feeders... safety heads... walkways and stairways... "Climax" automatic control equipment.

bolted steel tanks

BLACK, SIVALLS & BRYSON, INC.
Dept. 12-CQ2
7500 East 12th St., Kansas City 26, Missouri
Cable Address: Blacksiv, N. Y.

Failing JED Holemaster showing how the jet eductor is mounted on the rig for reverse circulation drilling.

New Portable Rig

The George E. Failing Co. has announced a portable rig which can be used either for conventional or reverse circulation drilling. The JED is designed to drill large diameter holes to 500-foot depths by the reverse circulation method, with six-inch ID drill pipe. Using the same centrifugal pump, it will drill 1,000-foot holes with 4½-inch conventional drill pipe. The unit will handle a maximum casing load of 56,000 pounds and the retracting rotary table permits a clearance for 60-inch casing or bits. Only a few optional items of equipment are necessary to change quickly from reverse circulation to regular rotary drilling.

One of the outstanding features of the JED rig is the Jet Eductor. This is a hydraulic jet mechanism, so designed that it develops an exceptionally high vacuum, thus enabling operations to a greater depth. The jet eductor is instantly self-priming and the use of separate priming devices is eliminated. The streamlined six-inch full opening through the jet, which has no moving parts, is designed so that all the cuttings, grit and boulders in the return line completely by-pass all mechanical devices. The centrifugal pump handles the small quantity of cutting-free water necessary to actuate the jet.

New Grooved-End Semi-Steel Valve

A new grooved-end version of its standard two-bolt yoke type Nordstrom semi-steel lubricated plug valves has been introduced by Rockwell Manufacturing Co. to make it possible to connect valves to steel pipe with grooved end couplings. With this method, a tight, permanent connection can be made in a matter of minutes and lines may be dismantled as often as necessary without damage to the pipe or grooved end couplings.

This method also eliminates the need for level ditching because a deflection of several degrees at every joint allows the lines to follow the uneven contours of the ground. This flexible connection also offsets pipe vibration and overcomes the problem of pipe expansion and contraction.

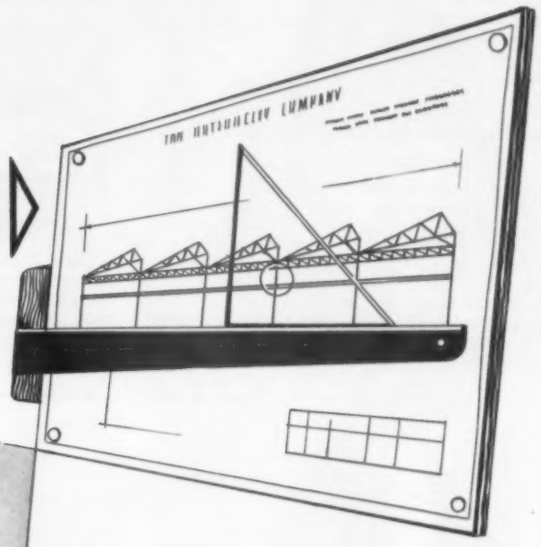
Petreco Announces Sediment Separator

The Petreco division of the Petrolite Corp. has announced the development and commercial application of an electric sediment separator for the purification of hydraulic pumping system power oil. The separator processes the crude (to be used as power oil) after it has been dehydrated by one of the conventional commercial demulsifying processes. The powerful electric field in the separator precipitates the residual moisture and solids, the clean power oil passing on into the hydraulic pumping system. In one typical installation, the removal percentage of BS&W was 96 percent and the solid materials were reduced 75 percent.

Creole Executive Committee Named

An executive committee has been elected by Creole Petroleum Corp. to act when the board of directors is not in session. The committee replaces the former management committee. Members of the new executive committee include A. D. Proudfit, president; H. W. Haight, executive vice president; L. Cade, H. A. Jarvis, G. Zuloaga and C. V. Montague, secretary.

from drawing board



to erection on site

BUTTERLEY

Constructional Steelwork

The Butterley Company has been engaged in constructional steelwork from its early days and examples are to be found in all parts of the British Isles and in many countries overseas. From design, through the stages of fabrication to erection on site, every structure is invested with the skill and knowledge which have made the Butterley Company famous in the field of constructional steelwork. Welded methods are widely employed today and the shops are well-equipped to undertake the largest and heaviest work of this nature.

THE BUTTERLEY COMPANY LIMITED
RIPLEY, DERBY, ENGLAND
LONDON OFFICE: 20 ASHLEY PLACE, VICTORIA, S.W.1

CS-37

Mass Spectrometer Bulletin

A new bulletin (GEC-587A) on the use of the mass spectrometer for chemical analysis by mass separation has been announced as available from the General Electric Company, Schenectady 5, New York.

Halliburton Moves Morton to Houston

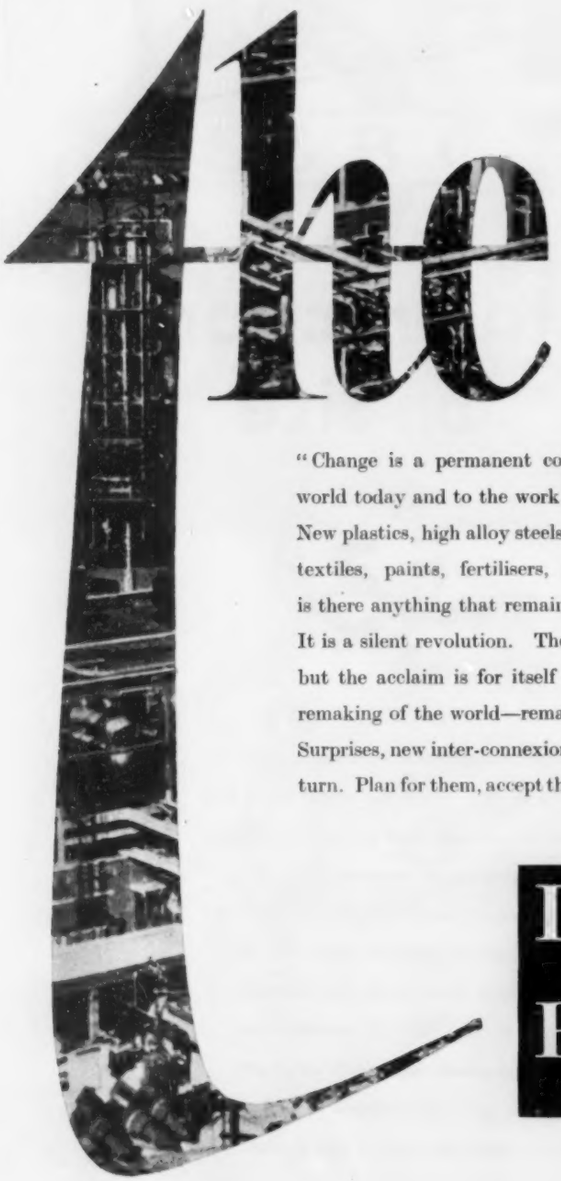
Tom E. Morton has been transferred to Houston as assistant division manager and division engineer of Halliburton Oil Well Cementing Co.'s South Texas division. He was formerly at Dallas. Mr. Morton joined Halliburton in 1941 following his graduation the previous year from the University of Oklahoma with a B.S. degree in petroleum engineering. During World War II he served as a captain with the Corps of Engineers in the Pacific area.

Appointed Drilling Manager for Oil & Gas Property Management

Lee J. Thronson has been appointed manager of drilling and production operations of Oil and Gas Property Management, Inc. He was formerly associated with Mendota Oil Company in Fort Worth as manager of production. He was with Sun Oil Company's Dallas division from 1938 until March 1952, serving as district engineer at McAllen and Corpus Christi and as production superintendent at Fremont, Texas.

Platformer on Stream

Great Southern Chemical Corp. recently put on stream at its Corpus Christi, Texas, refinery a 4,000 b/d UOP Platformer integrated with a Udex unit. The unit is producing nitration grade benzene and toluene. Construction of the new process facilities was handled by Procon, Incorporated.



The silent revolution

"Change is a permanent condition" is a saying that applies to the world today and to the work of chemical engineering in that world. New plastics, high alloy steels, light metals, cements, ceramics, synthetic textiles, paints, fertilisers, adhesives, resins, drugs and dyes . . . is there anything that remains untouched by the Chemical Revolution? It is a silent revolution. The new fabric is accepted, indeed acclaimed, but the acclaim is for itself alone. The miracle in their midst—the remaking of the world—remains unseen by those it will benefit most. Surprises, new inter-connexions, new vistas of opportunity arise at every turn. Plan for them, accept them, welcome them, cause them to happen...

D & C
AND WM.
PRESS
LTD.

civil, mechanical and chemical contracting engineers at home and abroad

Head Office: 27 ASHLEY PLACE, LONDON, S.W.1. *VICtoria 9751 (6 lines).* *Demcopress, London*
TA5648

Ammonia Process Booklet

Yield and cost advantages, principal operating features, and economics of a unique process design for ammonia plants are outlined in an 8-page booklet of which copies are available on request from The M. W. Kellogg Co., 225 Broadway, New York 7, New York. The present process includes design innovations developed in the company's own semi-commercial plant being incorporated in two new units currently under construction by Kellogg in the U. S.

Among the unusual features of the process is a reforming step which saves compressor horsepower. A special reactor has been designed with efficient cooling of the gases between layers of catalyst. A near-isothermal condition results in the reactor, leading to longer catalyst life, lower maintenance cost, and higher conversion per pass.

Economic studies summarized in the booklet give the requirements per ton of product for charge stock, catalyst, chemicals and utilities, as well as estimated erected plant costs for ammonia plants of varying capacities utilizing various feeds (natural gas, hydrogen gas, and hydrogen-rich gas).

Oil Price Study to be Published

Price Making and Price Behavior in the Petroleum Industry, a study of the actual techniques of business rivalry made with the full cooperation of the oil industry, was published by the Yale University Press on January 27, 1954 ($4.00). The book is written by Ralph Cassady, Jr., professor of marketing at the University of California. It is the first book in the monograph series of the petroleum industry to be published by the Yale University Press. Two other studies which will be published when ready are *Conservation and Production*, by Professor Erich W. Zimmerman of the University of Texas, and *Integration and Combination*, by Professors Melvin de Chazeau and Alfred E. Kahn of Cornell University.

To Build Gasoline Plant

A natural gasoline plant in the West Seminole field of Gaines County, Texas, will be built and operated by Cities Service Oil Co. for a group which includes Cities Service as majority owner, Atlantic Refining, Burdell Oil, Magnolia Petroleum, Superior Oil, Sinclair Oil & Gas, Shell Oil and Great Western Drilling companies.

It has been designed to gather and process all West Seminole gas and produce 55,000 gallons daily of natural gasoline and LPGas. Construction will be by Delta Engineering Corp. of Houston.

New Power Units

Seven new six-cylinder carbureted models have recently been added to the International power unit line, according to announcement by Paul L. Molnar, industrial sales manager of the International Harvester Export Co., Chicago. With the addition of these new engines, the line now includes 18 diesel, gasoline or gas models ranging from 16.5 to 200 net horsepower. There are 12 gas-gasoline models.

Transformer Buyer's Guide

The 1954 edition of the G-E Instrument Transformer Buyer's Guide, containing basic, up-to-date information on the complete General Electric line, has been announced as available from the company at Schenectady 5, N. Y. The fully illustrated, 96-page publication, GEA-4626G, contains ratings, ASA accuracy classifications, and prices of all G-E indoor and outdoor potential and current transformers.

Amplidyne Booklet

Amplidyne systems, how they operate, and where they can be used are described in a new 24-page booklet published by General Electric Company, Schenectady 5, New York. Copies of GEA-4053 are available on request.

Jenkins

of ROTHERHAM

for

Fractionating column 6'-0" dia. x 65'-0" high made for Foster Wheeler Ltd. for Hess Products Ltd. : Fatty Acid Plant.

IVANHOE TRADE MARK

Welded Work

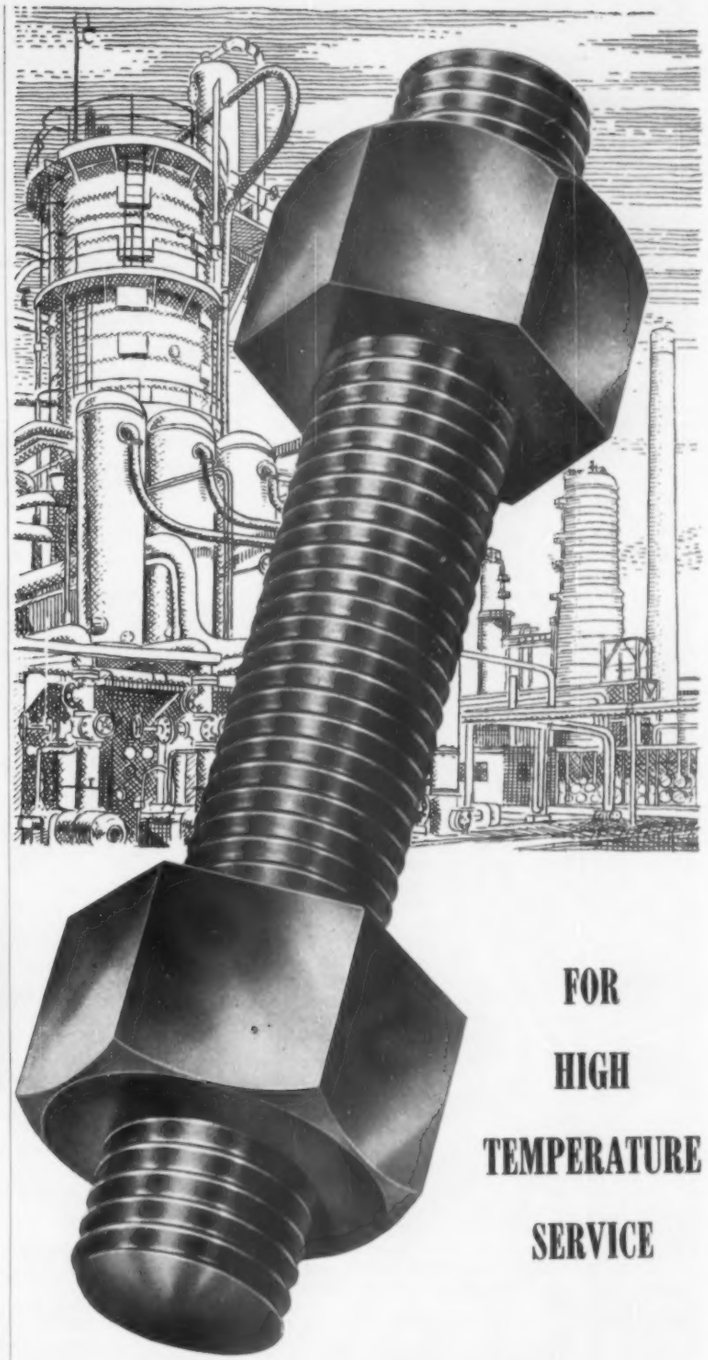
The Ivanhoe trademark identifies the craftsmanship and dependability of Jenkins-welded equipment. Pipe work, tanks, fractionating columns, condensers, pressure vessels, are typical examples of the fabricated welded work we are producing to Class I standard.

Our new catalogue "Welded Fabrications" details our organisation and facilities. May we send you a copy?

Robert Jenkins & Co. Ltd.
ESTABLISHED 1856
ROTHERHAM

ROBERT JENKINS & CO. LTD., ROTHERHAM, ENGLAND

Telephone: Rotherham 4201-6 (6 lines)



FOR HIGH TEMPERATURE SERVICE

Conforming to B.S.S. 1750-1951, Stud Bolts and Nuts are being supplied by Rubery Owen to all the principal Oil Companies and Refinery Equipment Manufacturers in ever increasing quantities. Special production facilities have been planned to suit every requirement to both British and American Standards with either Unified or Whitworth Threads.

RUBERY OWEN
STUD BOLTS AND NUTS

RUBERY, OWEN & CO., LTD., DARLASTON, SOUTH STAFFS., ENGLAND

Member of the Owen Organisation.

London Export Department: Kent House, Market Place, Oxford Circus, W.1.

Canadian Office: 1470, The Queensway, Postal Station N, Toronto, 14.

"The City of Tampa," a seagoing LPGas barge of 500,000 gallons capacity and the first large-capacity barge of its kind, recently was put in service by Warren Petroleum. The sea-going tug "Warrengas" of the Cook Towing Company of Houston has been assigned to the barge.

LPGas Barge Launched

The "City of Tampa," first large capacity seagoing LPGas barge ever constructed, has been placed in service by Warren Petroleum Corp. after its launching at Beaumont, Texas on November 23, 1953.

With the completion of the barge's maiden voyage from Houston, Texas to Tampa, Florida with a cargo of 500,000 gallons of LPGas, Warren also has placed in operation its recently completed 1,000,000 gallon capacity distributing terminal at Tampa. When a terminal now under construction at Matanzas, Cuba is completed, the barge also will transport LPGas to that port.

The "City of Tampa" was constructed by the shipbuilding division of Bethlehem Steel Co. at its Beaumont, Texas yards after models were tested in a towing tank operated by the University of Michigan. Its designed towing speed is 10½ knots, and a seagoing tug, the "Warrengas," was constructed by the Cook Towing Co. of Houston for specific assignment to this barge.

The barge is 242 feet long, 48 feet wide and 18 feet from keel to deck. It has seven horizontal tanks below its deck. Each tank has a dome extending through the deck and all piping connections are made into the domes above the deck. Five of the tanks are approximately 14 feet in diameter and 83 feet long and have a capacity of approximately 82,000 gallons each. The other two are approximately 14 feet in diameter and 59 feet in length with capacities of approximately 60,000 gallons each. They have a steel thickness of 1.3 inches and are believed to be among the largest ever fabricated for the storage or transportation of propane. The terminal at Tampa is equipped with barge unloading and transport truck loading facilities. LPGas will be hauled by transport truck direct from the terminal to Warren's distributors and utility and industrial consumers within a 100 to 125-mile radius of Tampa.

The importance of the terminal and barge to the Tampa area is evidenced by the fact that they will provide adjacent large-scale storage from which Warren's distributors can obtain over-night delivery. This will permit the distributors to handle easily both the usual and the unusual peak load demands, as contrasted with their problem of handling these demands when having to rely on tank car deliveries from as far away as West Texas.

Gas Lift Book

Camco, Inc., P. O. Box 9364, Houston, Texas, has published a new manual "The Power of Gas" by C. V. Kirkpatrick, professor of petroleum engineering at the University of Houston. It is published for the benefit of the users of gas lift for whom copies are available on request.

GLASSES & GASKETS

MAGNIFYING

ERNST WATER COLUMN & GAGE CO.

Send for Catalog, **LIVINGSTON, N. J.**

ALL SIZES TO FIT YOUR GAGES & VALVES

ADVERTISERS' INDEX

(Advertising Agencies in Italics)

Aerofin Corporation 16
Richards & Webb, Inc.

Anglo-Iranian Oil Co. Ltd. 81
S. H. Benson Ltd.

Arabian American Oil Co. 15

The J. B. Beaird Co., Inc. 23
Glenn Mason Advertising

Bethlehem Steel Export Corp. 13
Gotham Advertising Co.

Black, Sivalls & Bryson, Inc. (Export Division) 88
R. J. Potts-Calkins & Holden, Inc.

The Butterley Co. Ltd. 89
Rowlinson-Broughton

California Texas Oil Co., Inc. 87
Erwin, Wasey & Co., Inc.

Cape Asbestos Co. Ltd. 67

Catalytic Construction Co. 54
Doremus-Eshleman Co.

Chicago Bridge & Iron Co. 94
Russell T. Gray, Inc.

Clark Brothers Co. 64-65
Harold Warner Co.

Richard Costain Ltd. 71

Davey, Paxman & Co. Ltd. 72
Rooster Publicity Ltd.

Dresser Industries, Inc. 18-19
Don L. Baxter, Inc.

E. I. du Pont de Nemours & Co., Inc. 77-78
Charles L. Rumrill & Co., Inc.

Ernst Water Column & Gage Co. 92

Ethyl Corporation 7
Batten, Barton, Durstine & Osborn, Inc.

Flexible Drives Ltd. 82
Boswell & Barratt Ltd.

Fluor Corporation 14
Dozier, Eastman & Co.

Foster Wheeler Corporation 83
Rickard & Co., Inc.

General American Transportation Corp. 85
Weiss & Geller, Inc.

General Electric International 5
Grant Advertising, Inc.

General Electric Co. of England Ltd. 84
Kingscott Ltd.

Gulf Oil Corporation 17
Young & Rubicam, Inc.

J. P. Hall & Sons Ltd. 79
Rooster Publicity Ltd.

Halliburton Oil Well Cementing Co. 30
Hill & Christopher, Inc.

Herb J. Hawthorne, Inc. 62
Brennan Advertising Agency

Houdry Process Corporation 11
John Falkner Arndt & Co., Inc.

Hughes Tool Co. Cover III
Foote, Cone & Belding

International Harvester Export Co. 10
McCann-Erickson Corporation

International Paints Ltd. 66
Mayfair Advertising Ltd.

Robert Jenkins & Co. Ltd. 91

Richard Klinger Ltd. 75
S. H. Wright & Co. Ltd.

Koenig Iron Works 79
Brennan Advertising Agency

Lake & Elliot Ltd. 79
Ripley Preston & Co. Ltd.

Lane-Wells Company Cover II
Darwin H. Clark Co.

The Lummus Company 28
Sterling Advertising Agency

McCullough Tool Co. 2
Richard P. Casterline Advertising

Makin Drilling Company 84

Metropolitan Vickers Electric Co. Ltd. 20
Technical & General Adv. Ltd.

A. P. Newall & Co. Ltd. 1
Osborne-Peacock Co. Ltd.

Samuel Osborn Co. Ltd. 73

Philco Corp. (Gov't. & Ind. Div.) 8-9
Julian G. Pollock Co.

D. & C. & Wm. Press Ltd. 90

Pyrene Company Ltd. 12
Nelson Advertising Service Ltd.

Charles Richards & Co. Ltd. 86
H. C. Longley Ltd.

Rubery, Owen & Co., Ltd. 91
H. C. Longley Ltd.

Schlumberger Well Surveying Corp. 53
Rives, Dyke & Co.

Scientific Design Co., Inc. 57
Michel-Cather, Inc.

Socony-Vacuum Oil Co., Inc. 26
Compton Advertising, Inc.

Standard Oil Co. of New Jersey 93
McCann-Erickson Corporation

Standard-Vacuum Oil Co. 61
Sam J. Gallay Advertising

Sun Shipbuilding & Dry Dock Co. 22
Doremus-Eshleman Co.

The Texas Company 4
Cunningham & Walsh, Inc.

Timken Roller Bearing Co., Steel Div. 63
Batten, Barton, Durstine & Osborn, Inc.

The United Steel Companies Ltd. 27
Rowlinson-Broughton

Universal Oil Products Co. 24-25
Simmonds & Simmonds, Inc.

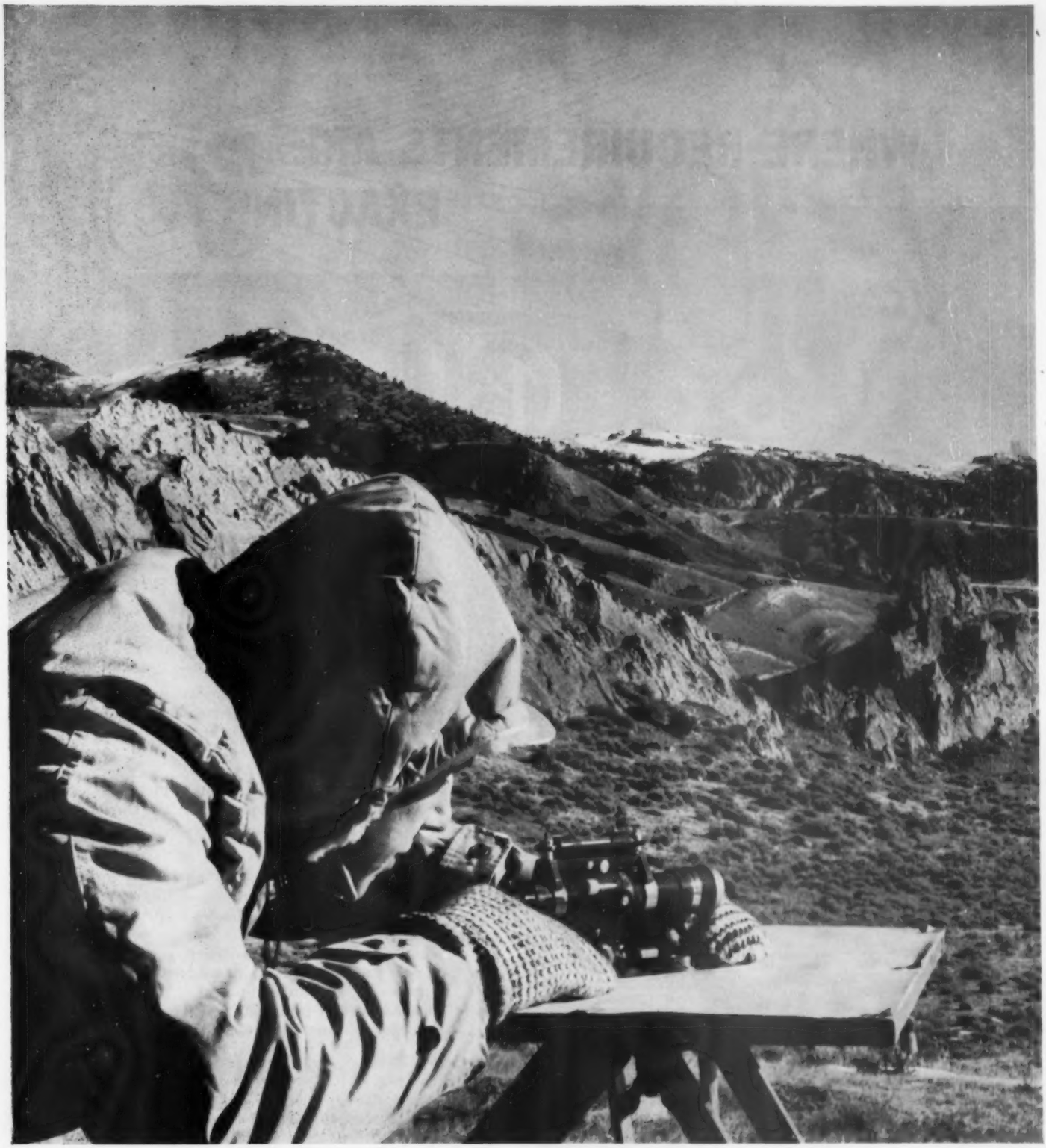
Westinghouse Electric International Co. 59
National Export Advertising Service, Inc.

Whessoe Ltd. 21
Roles & Parker Ltd.

Worthington Corporation 6
James Thomas Chirurg Co.

Wyatt Metal & Boiler Works Cover IV
Wallace Davis & Co.

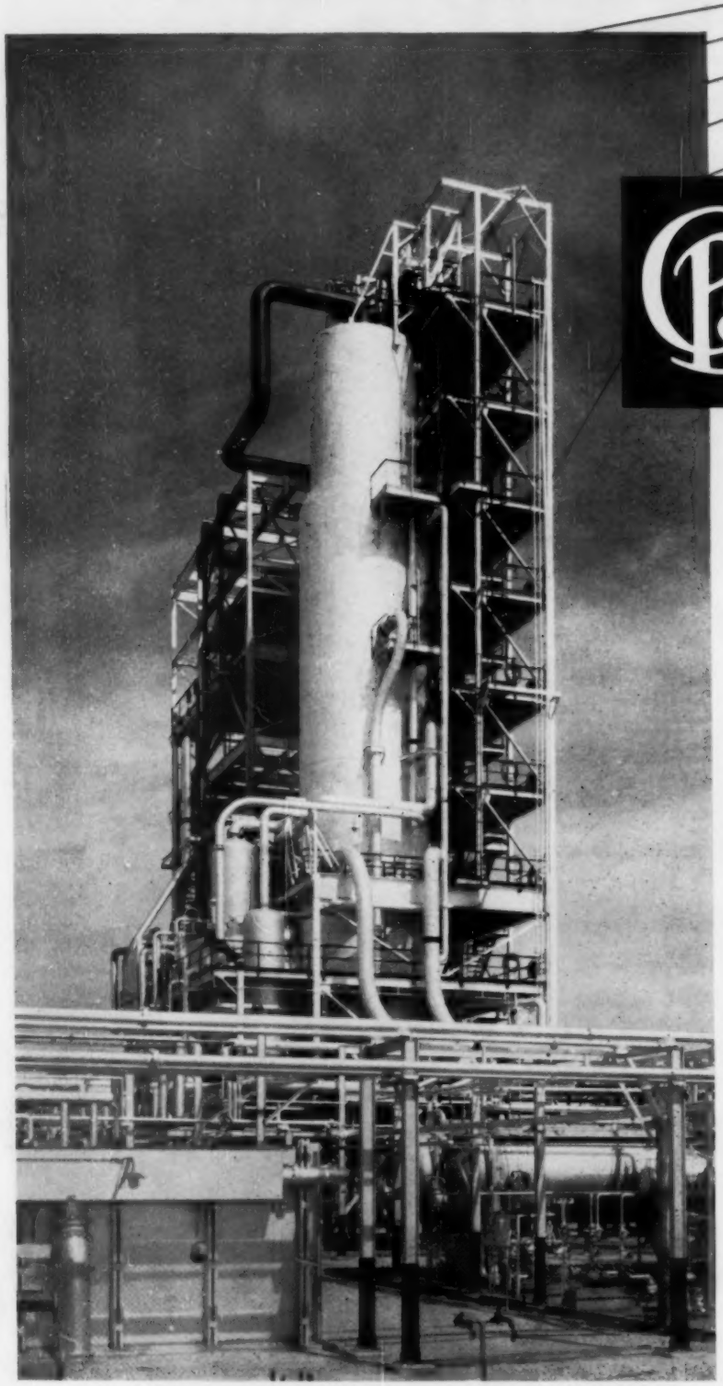
Youngstown Sheet & Tube Co. 3
The Griswold-Eshleman Co.



"To the free man, all things are possible. Opportunity is the wand which can change the useless into the useful, waste into raw materials of great value, exhaustible resources into inexhaustible resources. It is the key that unlocks the greatest energy source of all—the infinite power of the human individual."

STANDARD OIL COMPANY (NEW JERSEY)
AND AFFILIATED COMPANIES

WHERE REQUIREMENTS ARE EXACTING . . .



ENGINEERS, SHOPS AND FIELD CREWS HAVE THE ANSWER

If you have a steel plate work problem, Chicago Bridge & Iron Company can supply the answers! Whether refinery towers or storage tanks . . . sixty-four years of experience, skill, modern methods and workmanship provide the right answers.

Chicago Bridge & Iron Company is equipped to design, fabricate and erect a wide range of steel plate structures to meet your needs. Our shops have complete equipment for stress-relieving and x-raying to code requirements. We have facilities at all four of our plants to pickle and paint fabricated steel plates by the Horton® phosphoric acid process.

CB&I builds refinery vessels and towers, flat-bottom tanks, elevated water tanks, Hortonspheres, Hortonspheroids, Horton Floating Roofs, Vapor-spheres, Hortondome Roofs, and other welded steel plate structures for the petroleum industry. Whether you operate a refinery, pipe line teminal, or a gas processing plant, investigate the advantages of Horton equipment. Write our nearest office for further information, estimates or quotations. There is no obligation.

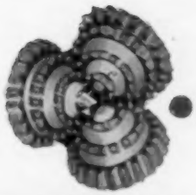
Atmospheric Fractionating Tower 15 ft. 6 in. in diam. by 13 ft. diam. by 99 ft. 3 in. built by Chicago Bridge & Iron Company. Foster-Wheeler Company were the designers.

CHICAGO BRIDGE & IRON COMPANY

Chicago • Houston • Tulsa • San Francisco • Birmingham • Atlanta • Cleveland • Philadelphia • Pittsburgh • Salt Lake City • Los Angeles • Boston • Seattle • Detroit
Plants: Birmingham, Chicago, Salt Lake City and Greenville, Pa., U.S.A.
Export Office—165 Broadway Building, New York 6, N. Y., U.S.A.

REPRESENTATIVES AND LICENSEES

Ateliers et Chantiers de la Seine Maritime, Paris, France
Constructions Metalliques de Provence, Arles-sur-Rhone, France
Comprimo N.V., 21, Amstel (C) Netherlands
Compagnia Tecnica Industrie Petroli, Rome, Italy
Chicago Bridge & Iron Company, Ltd., Apartado 1348, Caracas, Venezuela
Whessoe Limited, Darlington, England
Motherwell Bridge & Engineering Company, Limited, Motherwell, Scotland
Horton Steel Works Limited Fort Erie, Ontario, Canada
W. P. Bryant, Edifico Abreu 402, Havana, Cuba
Sociedade Chibridge de Construcoes Ltda., Av. General Justo, 275, Grupo 306, Rio de Janeiro, Brazil



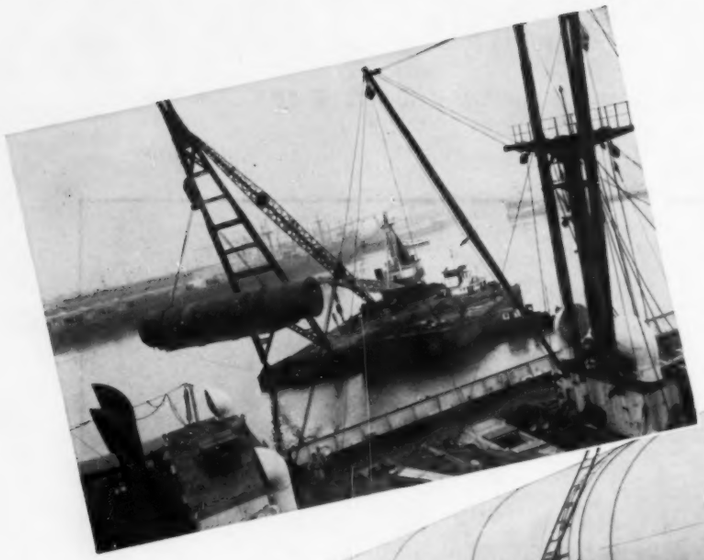
YOUR GUARANTEE OF PERFORMANCE

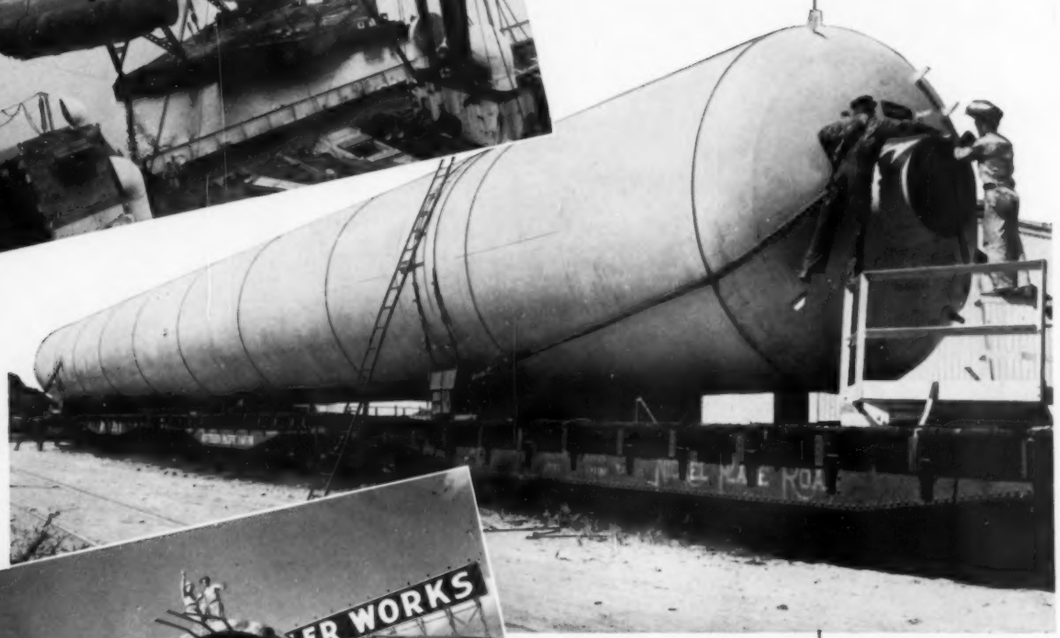
HUGHES "OW" SERIES ROCK BITS have long been a favorite for hard to medium hard formation drilling.

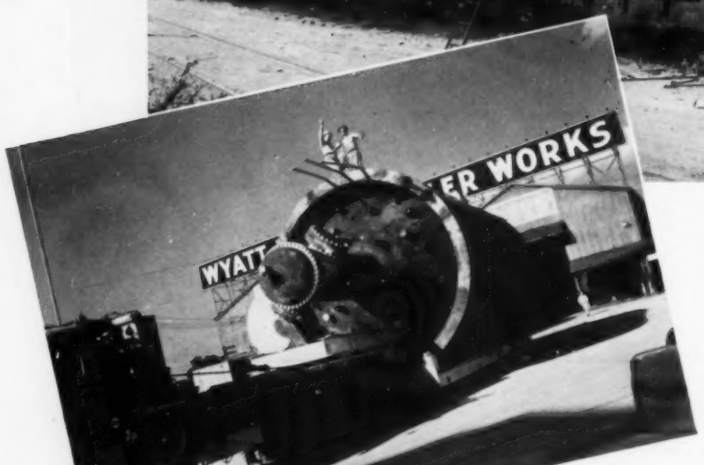
Because of unique design characteristics these bits combine chipping and crushing action with moderate twisting, tearing action. The result is: the OW Series provides the most efficient bits for such formations as hard, tough dolomite, lime, shale, slate, and softer ranges of these formations.

The constant improvement being made in Hughes rock bits is a never-ending process. It is your guarantee of consistent, outstanding performance.

Destination . . . Service







● Whatever the transportation and however far their journey, the products of Wyatt's Fabrication have one final destination . . .
Service to the Processing Industries.

MANUFACTURERS AND ERECTORS SINCE 1913

Wyatt's
HOUSTON-DALLAS-NEW YORK-TULSA